

City of San Diego

CONTRACTOR'S NAME: SCW Contracting Corporation
ADDRESS: 2525 N Old Hwy 395, Fallbrook, CA 92028
TELEPHONE NO.: 760-728-1308 ext. 115 FAX NO.: 760-728-2517
CITY CONTACT: Rosa Riego, Contract Specialist, Email: RRiego@sandiego.gov
Phone No. (619) 533-3426, Fax No. (619) 533-3633
I. Hoffmann/A. Jaro/mlw

BIDDING DOCUMENTS



FOR

ORIGINAL

SPS 23T RELIABILITY IMPROVEMENTS

BID NO.: _____ K-17-1475-DBB-3
SAP NO. (WBS/IO/CC): _____ B-14131
CLIENT DEPARTMENT: _____ 2000
COUNCIL DISTRICT: _____ 8
PROJECT TYPE: _____ BP

THIS CONTRACT WILL BE SUBJECT TO THE FOLLOWING:

- > THE CITY'S SUBCONTRACTING PARTICIPATION REQUIREMENTS FOR SLBE PROGRAM.
- > PREVAILING WAGE RATES: STATE FEDERAL
- > APPRENTICESHIP

BID DUE DATE

2:00 PM

MAY 16, 2017

CITY OF SAN DIEGO

PUBLIC WORKS CONTRACTS

**1010 SECOND AVENUE, 14th FLOOR, MS 614C
SAN DIEGO, CA 92101**

ENGINEER OF WORK

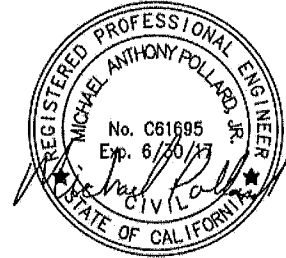
The engineering Specifications and Special Provisions contained herein have been prepared by or under the direction of the following Registered Engineer:

Michael Pollard

1) Registered Engineer

4/5/2017

Date



Elif Cetin

2) For City Engineer

4/6/2017

Date

Seal:



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NOTICE INVITING BIDS

1. **SUMMARY OF WORK:** This is the City of San Diego's (City) solicitation process to acquire Construction services for **SPS 23T Reliability Improvements**. For additional information refer to Attachment A.
2. **FULL AND OPEN COMPETITION:** This contract is open to full competition and may be bid on by Contractors who are on the City's current Prequalified Contractors' List. For information regarding the Contractors Prequalified list visit the City's web site: <http://www.sandiego.gov>.
3. **ESTIMATED CONSTRUCTION COST:** The City's estimated construction cost for this project is **\$1,400,000**.
4. **BID DUE DATE AND TIME ARE: MAY 16, 2017 AT 2:00 PM**
5. **PREVAILING WAGE RATES APPLY TO THIS CONTRACT:** Refer to Attachment D.
6. **LICENSE REQUIREMENT:** The City has determined that the following licensing classification(s) are required for this contract: **A**
7. **SUBCONTRACTING PARTICIPATION PERCENTAGES:** Subcontracting participation percentages apply to this contract.
 - 7.1. The City has incorporated **mandatory** SLBE-ELBE subcontractor participation percentages to enhance competition and maximize subcontracting opportunities. For the purpose of achieving the mandatory subcontractor participation percentages, a recommended breakdown of the SLBE and ELBE subcontractor participation percentages based upon certified SLBE and ELBE firms has also been provided to achieve the mandatory subcontractor participation percentages:

1. SLBE participation	11.5%
2. ELBE participation	24.4%
3. Total mandatory participation	35.9%
 - 7.2. The Bid may be declared non-responsive if the Bidder fails to meet the following requirements:
 - 7.2.1. Include SLBE-ELBE certified subcontractors at the overall mandatory participation percentage identified in this document; **OR**
 - 7.2.2. Submit Good Faith Effort documentation, saved in searchable Portable Document Format (PDF) and stored on Compact Disc (CD) or Digital Video Disc (DVD), demonstrating the Bidder made a good faith effort to outreach to and include SLBE-ELBE Subcontractors required in this document within 3 Working Days of the Bid opening if the overall mandatory participation percentage is not met.

8. PRE-BID MEETING:

- 8.1.** Prospective Bidders are encouraged to attend the Pre-Bid Meeting. The purpose of the meeting is to discuss the scope of the Project, submittal requirements, the pre-qualification process and any Equal Opportunity Contracting Program requirements and reporting procedures. To request a sign language or oral interpreter for this visit, call the Public Works Contracts Division at (619) 533-3450 at least 5 Working Days prior to the meeting to ensure availability. The Pre-Bid meeting is scheduled as follows:

Date: April 26, 2017
Time: 10:00 AM
Location: 1010 Second Avenue, Suite 1400 (Large Conf. Rm.), San Diego, CA 92101

Attendance at the Pre-Submittal Meeting will be evidenced by the Bidder's representative's signature on the attendance roster. It is the responsibility of the Bidder's representative to complete and sign the attendance roster.

- 9. PRE-BID SITE VISIT:** All those wishing to submit a bid are encouraged to visit the Work Site with the Engineer. The purpose of the Site visit is to acquaint Bidders with the Site conditions. To request a sign language or oral interpreter for this visit, call the Public Works Contracts at (619) 533-3450 at least 5 Working Days prior to the meeting to ensure availability. The Pre-Bid Site Visit is scheduled as follows:

Time: 2:30 PM
Date: April 26, 2017
Location: 2390 Cactus Road, San Diego, CA 92154

10. AWARD PROCESS:

- 10.1.** The Award of this contract is contingent upon the Contractor's compliance with all conditions of Award as stated within these documents and within the Notice of Intent to Award.
- 10.2.** Upon acceptance of a Bid, the City will prepare contract documents for execution within approximately 21 days of the date of the Bid opening. The City will then award the Contract within approximately 14 days of receipt of properly signed Contract, bonds, and insurance documents.
- 10.3.** This contract will be deemed executed and effective only upon the signing of the Contract by the Mayor or his designee and approval as to form the City Attorney's Office.
- 10.4.** The low Bid will be determined by Base Bid alone.
- 10.5.** Once the low bid has been determined, the City may, at its sole discretion, award the contract for the Base bid alone.

11. SUBMISSION OF QUESTIONS:

- 11.1.** The Director (or Designee) of Public Works Department is the officer responsible for opening, examining, and evaluating the competitive Bids submitted to the City for the acquisition, construction and completion of any public improvement except when otherwise set forth in these documents. Any questions related to this solicitation shall be submitted to:

Public Works Contracts
1010 Second Avenue, 14th Floor
San Diego, California, 92101
Attention: Rosa Riego

OR:

RRiego@sandiego.gov

- 11.2.** Questions received less than 14 days prior to the date for opening of Bids may not be considered.
- 11.3.** Questions or clarifications deemed by the City to be material shall be answered via issuance of an addendum and posted to the City's online bidding service.
- 11.4.** Only questions answered by formal written addenda shall be binding. Oral and other interpretations or clarifications shall be without legal effect. It is the Bidder's responsibility to be informed of any addenda that have been issued and to include all such information in its Bid.

INSTRUCTIONS TO BIDDERS

1. PREQUALIFICATION OF CONTRACTORS:

- 1.1. Contractors submitting a Bid must be pre-qualified for the total amount proposed, including all alternate items, prior to the date of submittal. Bids from contractors who have not been pre-qualified as applicable and Bids that exceed the maximum dollar amount at which contractors are pre-qualified may be deemed **non-responsive** and ineligible for award. Complete information and links to the on-line prequalification application are available at:

<http://www.sandiego.gov/cip/bidopps/prequalification.shtml>

- 1.2. The completed application must be submitted online no later than 2 weeks prior to the bid opening. For additional information or the answer to questions about the prequalification program, contact David Stucky at 619-533-3474 or dstucky@sandiego.gov.
- 1.3. Due to the City's fiduciary requirement to safeguard vendor data, City staff will not be able to provide information regarding contractors' prequalification status over the telephone. Contractors may access real-time information about their prequalification status via their vendor profile on [PlanetBids™](#).

2. ELECTRONIC FORMAT RECEIPT AND OPENING OF BIDS: Bids will be received in electronic format (eBids) EXCLUSIVELY at the City of San Diego's electronic bidding (eBidding) site, at: <http://www.sandiego.gov/cip/bidopps/index.shtml> and are due by the date, and time shown on the cover of this solicitation.

- 2.1. **BIDDERS MUST BE PRE-REGISTERED** with the City's bidding system and possess a system-assigned Digital ID in order to submit and electronic bid.
- 2.2. The City's bidding system will automatically track information submitted to the site including IP addresses, browsers being used and the URLs from which information was submitted. In addition, the City's bidding system will keep a history of every login instance including the time of login, and other information about the user's computer configuration such as the operating system, browser type, version, and more. Because of these security features, Contractors who disable their browsers' cookies will not be able to log in and use the City's bidding system.
- 2.3. The City's electronic bidding system is responsible for bid tabulations. Upon the bidder's or proposer's entry of their bid, the system will ensure that all required fields are entered. **The system will not accept a bid for which any required information is missing.** This includes all necessary pricing, subcontractor listing(s) and any other essential documentation and supporting materials and forms requested or contained in these solicitation documents.

2.4. BIDS REMAIN SEALED UNTIL BID DEADLINE. eBids are transmitted into the City's bidding system via hypertext transfer protocol secure (https) mechanism using SSL 128-256 bit security certificates issued from Verisign/Thawte which encrypts data being transferred from client to server. Bids submitted prior to the "Bid Due Date and Time" are not available for review by anyone other than the submitter which has until the "Bid Due Date and Time" to change, rescind or retrieve its proposal should it desire to do so.

2.5. BIDS MUST BE SUBMITTED BY BID DUE DATE AND TIME. Once the bid deadline is reached, no further submissions are accepted into the system. Once the Bid Due Date and Time has lapsed, bidders, proposers, the general public, and City staff are able to immediately see the results on line. City staff may then begin reviewing the submissions for responsiveness, EOCP compliance and other issues. The City may require any Bidder to furnish statement of experience, financial responsibility, technical ability, equipment, and references.

2.6. RECAPITULATION OF THE WORK. Bids shall not contain any recapitulation of the Work. Conditional Bids may be rejected as being non-responsive. Alternative proposals will not be considered unless called for.

2.7. BIDS MAY BE WITHDRAWN by the Bidder only up to the bid due date and time.

2.7.1. Important Note: Submission of the electronic bid into the system may not be instantaneous. Due to the speed and capabilities of the user's internet service provider (ISP), bandwidth, computer hardware and other variables, it may take time for the bidder's submission to upload and be received by the City's eBidding system. It is the bidder's sole responsibility to ensure their bids are received on time by the City's eBidding system. The City of San Diego is not responsible for bids that do not arrive by the required date and time.

2.8. ACCESSIBILITY AND AMERICANS WITH DISABILITIES ACT (ADA) COMPLIANCE: To request a copy of this solicitation in an alternative format, contact the Public Works Contract Specialist listed on the cover of this solicitation at least five (5) working days prior to the Bid/Proposal due date to ensure availability.

3. ELECTRONIC BID SUBMISSIONS CARRY FULL FORCE AND EFFECT

3.1. The bidder, by submitting its electronic bid, acknowledges that doing so carries the same force and full legal effect as a paper submission with a longhand (wet) signature.

3.2. By submitting an electronic bid, the bidder certifies that the bidder has thoroughly examined and understands the entire Contract Documents (which consist of the plans and specifications, drawings, forms, affidavits and the solicitation documents), and that by submitting the eBid as its bid proposal, the bidder acknowledges, agrees to

and is bound by the entire Contract Documents, including any addenda issued thereto, and incorporated by reference in the Contract Documents.

- 3.3.** The Bidder, by submitting its electronic bid, agrees to and certifies under penalty of perjury under the laws of the State of California, that the certification, forms and affidavits submitted as part of this bid are true and correct.
- 3.4.** The Bidder agrees to the construction of the project as described in Attachment "A-Scope of Work" for the City of San Diego, in accordance with the requirements set forth herein for the electronically submitted prices. The Bidder guarantees the Contract Price for a period of 120 days (90 days for federally funded contracts and contracts valued at \$500,000 or less) from the date of Bid opening. The duration of the Contract Price guarantee shall be extended by the number of days required for the City to obtain all items necessary to fulfill all conditions precedent.
- 4. BIDS ARE PUBLIC RECORDS:** Upon receipt by the City, Bids shall become public records subject to public disclosure. It is the responsibility of the respondent to clearly identify any confidential, proprietary, trade secret or otherwise legally privileged information contained within the Bid. General references to sections of the California Public Records Act (PRA) will not suffice. If the Contractor does not provide applicable case law that clearly establishes that the requested information is exempt from the disclosure requirements of the PRA, the City shall be free to release the information when required in accordance with the PRA, pursuant to any other applicable law, or by order of any court or government agency, and the Contractor will hold the City harmless for release of this information.
- 5. CONTRACTOR REGISTRATION AND ELECTRONIC REPORTING SYSTEM:**

 - 5.1.** Prior to the Award of the Contract or Task Order, you and your Subcontractors and Suppliers must register with the City's web-based vendor registration and bid management system. For additional information go to:

<http://www.sandiego.gov/purchasing/bids-contracts/vendorreg.shtml>.
 - 5.2.** The City may not award the contract until registration of all subcontractors and suppliers is complete. In the event this requirement is not met within the time frame specified in the Notice of Intent to Award letter, the City reserves the right to rescind the Notice of Award / Intent to Award and to make the award to the next responsive and responsible bidder / proposer.
- 6. JOINT VENTURE CONTRACTORS:** Provide a copy of the Joint Venture agreement and the Joint Venture license to the City within 10 Working Days after receiving the Contract forms. See 7-6, "The Contractors Representative" in The GREENBOOK and 7-6.1 in The WHITEBOOK.

7. **PREVAILING WAGE RATES WILL APPLY:** Refer to Attachment D.
8. **SUBCONTRACTING PARTICIPATION PERCENTAGES:** Subcontracting participation percentages apply to this contract. Refer to Attachment E.
9. **INSURANCE REQUIREMENTS:**
- 9.1. All certificates of insurance and endorsements required by the contract are to be provided upon issuance of the City's Notice of Intent to Award letter.
- 9.2. Refer to sections 7-3, "LIABILITY INSURANCE", and 7-4, "WORKERS' COMPENSATION INSURANCE" of the Supplementary Special Provisions (SSP) for the insurance requirements which must be met.
10. **REFERENCE STANDARDS:** Except as otherwise noted or specified, the Work shall be completed in accordance with the following standards:

Title	Edition	Document Number
Standard Specifications for Public Works Construction ("The GREENBOOK") http://www.greenbookspecs.org/	2015	PWPI070116-01
City of San Diego Standard Specifications for Public Works Construction ("The WHITEBOOK")* https://www.sandiego.gov/publicworks/edocref/greenbook	2015	PWPI070116-02
City of San Diego Standard Drawings* https://www.sandiego.gov/publicworks/edocref/standarddraw	2016	PWPI070116-03
Citywide Computer Aided Design and Drafting (CADD) Standards https://www.sandiego.gov/publicworks/edocref/drawings	2016	PWPI092816-04
California Department of Transportation (CALTRANS) Standard Specifications - http://www.dot.ca.gov/des/oe/construction-contract-standards.html	2015	PWPI092816-05
CALTRANS Standard Plans http://www.dot.ca.gov/des/oe/construction-contract-standards.html	2015	PWPI092816-06
California Manual on Uniform Traffic Control Devices Revision 1 (CA MUTCD Rev 1) - http://www.dot.ca.gov/trafficops/camutcd/	2014	PWPI092816-07
NOTE: *Available online under Engineering Documents and References at: http://www.sandiego.gov/publicworks/edocref/index.shtml		

11. **CITY'S RESPONSES AND ADDENDA:** The City, at its discretion, may respond to any or all questions submitted in writing via the City's eBidding web site in the **form of an addendum**. No other responses to questions, oral or written shall be of any force or effect with respect to this solicitation. The changes to the Contract Documents through addenda are made effective as though originally issued with the Bid. The Bidders shall acknowledge the receipt of Addenda at the time of bid submission.
12. **CITY'S RIGHTS RESERVED:** The City reserves the right to cancel the Notice Inviting Bids at any time, and further reserves the right to reject submitted Bids, without giving any reason for such action, at its sole discretion and without liability. Costs incurred by the Bidder(s) as a result of preparing Bids under the Notice Inviting Bids shall be the sole responsibility of each bidder. The Notice Inviting Bids creates or imposes no obligation upon the City to enter a contract.
13. **CONTRACT PRICING:** This solicitation is for a Lump Sum contract with Unit Price provisions as set forth herein. The Bidder agrees to perform construction services for the City of San Diego in accordance with these contract documents for the prices listed below. The Bidder further agrees to guarantee the Contract Price for a period of 120 days from the date of Bid opening. The duration of the Contract Price guarantee may be extended, by mutual consent of the parties, by the number of days required for the City to obtain all items necessary to fulfill all contractual conditions.
14. **SUBCONTRACTOR INFORMATION:**
- 14.1. **LISTING OF SUBCONTRACTORS.** In accordance with the requirements provided in the "Subletting and Subcontracting Fair Practices Act" of the California Public Contract Code, the Bidder shall provide the **NAME** and **ADDRESS** of each Subcontractor who will perform work, labor, render services or who specially fabricates and installs a portion [type] of the work or improvement, in an amount in excess of 0.5% of the Contractor's total Bid. The Bidder shall also state within the description, whether the subcontractor is a **CONSTRUCTOR, CONSULTANT** or **SUPPLIER**. The Bidder shall further state within the description, the **PORTION** of the work which will be performed by each subcontractor under this Contract. The Contractor shall list only one Subcontractor for each portion of the Work. The **DOLLAR VALUE** of the total Bid to be performed shall be stated for all subcontractors listed. Failure to comply with this requirement may result in the Bid being rejected as **non-responsive** and ineligible for award. The Bidder's attention is directed to the Special Provisions - General; Paragraph 2-3, "Subcontracts", which stipulates the percent of the Work to be performed with the Bidders' own forces. The Bidder shall list all SLBE, ELBE, DBE, DVBE, MBE, WBE, OBE, SDB, WoSB, HUBZone, and SDVOSB Subcontractors for which Bidders are seeking recognition towards achieving any mandatory, voluntary (or both) subcontracting participation goals.

- 14.2. LISTING OF SUPPLIERS.** Any Bidder seeking the recognition of Suppliers of equipment, materials, or supplies obtained from third party Suppliers towards achieving any mandatory or voluntary (or both) subcontracting participation goals shall provide, at a minimum, the **NAME, LOCATION (CITY)** and the **DOLLAR VALUE** of each supplier. The Bidder will be credited up to 60% of the amount to be paid to the Suppliers for materials and supplies unless vendor manufactures or substantially alters materials and supplies, in which case, 100% will be credited. The Bidder is to indicate within the description whether the listed firm is a supplier or manufacturer. If no indication is provided, the listed firm will be credited at 60% of the listed dollar value for purposes of calculating the Subcontractor Participation Percentage.
- 14.3. LISTING OF SUBCONTRACTORS OR SUPPLIERS FOR ALTERNATES.** For subcontractors or suppliers to be used on additive or deductive alternate items, in addition to the above requirements, bidder shall further note "ALTERNATE" and alternate item number within the description.
- 15. SUBMITTAL OF "OR EQUAL" ITEMS:** See Section 4-1.6, "Trade Names or Equals" in The WHITEBOOK and as amended in the SSP.
- 16. AWARD:**
- 16.1.** The Award of this contract is contingent upon the Contractor's compliance with all conditions precedent to Award.
- 16.2.** Upon acceptance of a Bid, the City will prepare contract documents for execution within approximately 21 days of the date of the Bid opening and award the Contract approximately within 7 days of receipt of properly executed Contract, bonds, and insurance documents.
- 16.3.** This contract will be deemed executed and effective only upon the signing of the Contract by the Mayor or his designee and approval as to form the City Attorney's Office.
- 17. SUBCONTRACT LIMITATIONS:** The Bidder's attention is directed to Standard Specifications for Public Works Construction, Section 2-3, "SUBCONTRACTS" in The GREENBOOK and as amended in the SSP which requires the Contractor to self-perform not less than the specified amount. Failure to comply with this requirement shall render the bid **non-responsive** and ineligible for award.
- 18. AVAILABILITY OF PLANS AND SPECIFICATIONS:** Contract Documents may be obtained by visiting the City's website: <http://www.sandiego.gov/cip/>. Plans and Specifications for this contract are also available for review in the office of the City Clerk or Public Works Contracts.

19. **ONLY ONE BID PER CONTRACTOR SHALL BE ACCEPTED:** No person, firm, or corporation shall be allowed to make, file, or be interested in more than one (1) Bid for the same work unless alternate Bids are called for. A person, firm or corporation who has submitted a sub-proposal to a Bidder, or who has quoted prices on materials to a Bidder, is not hereby disqualified from submitting a sub-proposal or quoting prices to other Bidders or from submitting a Bid in its own behalf. Any Bidder who submits more than one bid will result in the rejection of all bids submitted.
20. **SAN DIEGO BUSINESS TAX CERTIFICATE:** The Contractor and Subcontractors, not already having a City of San Diego Business Tax Certificate for the work contemplated shall secure the appropriate certificate from the City Treasurer, Civic Center Plaza, First floor and submit to the Contract Specialist upon request or as specified in the Contract Documents. Tax Identification numbers for both the Bidder and the listed Subcontractors must be submitted on the City provided forms within these documents.
21. **BIDDER'S GUARANTEE OF GOOD FAITH (BID SECURITY) FOR DESIGN-BID-BUILD CONTRACTS:**
- 21.1. For bids \$250,000 and above, bidders shall submit Bid Security at bid time. Bid Security shall be in one of the following forms: a cashier's check, or a properly certified check upon some responsible bank; or an approved corporate surety bond payable to the City of San Diego for an amount of not less than 10% of the total bid amount.
- 21.2. This check or bond, and the monies represented thereby, will be held by the City as a guarantee that the Bidder, if awarded the contract, will in good faith enter into the contract and furnish the required final performance and payment bonds.
- 21.3. The Bidder agrees that in the event of the Bidder's failure to execute this contract and provide the required final bonds, the money represented by the cashier's or certified check will remain the property of the City; and the Surety agrees that it will pay to the City the damages, not exceeding the sum of 10% of the amount of the Bid, that the City may suffer as a result of such failure.
- 21.4. At the time of bid submission, bidders must upload and submit an electronic PDF copy of the aforementioned bid security. Whether in the form of a cashier's check, a properly certified check or an approved corporate surety bond payable to the City of San Diego, the bid security must be uploaded to the City's eBidding system. Within twenty-four (24) hours after the bid due date and time, the first five (5) apparent low bidders must provide the City with the original bid security.
- 21.5. Failure to submit the electronic version of the bid security at the time of bid submission AND failure to provide the original within twenty-four (24) hours may cause the bid to be rejected and deemed **non-responsive**.

22. AWARD OF CONTRACT OR REJECTION OF BIDS:

- 22.1.** This contract may be awarded to the lowest responsible and reliable Bidder.
- 22.2.** Bidders shall complete ALL eBid forms as required by this solicitation. Incomplete eBids will not be accepted.
- 22.3.** The City reserves the right to reject any or all Bids, to waive any informality or technicality in Bids received, and to waive any requirements of these specifications as to bidding procedure.
- 22.4.** Bidders will not be released on account of their errors of judgment. Bidders may be released only upon receipt by the City within 3 Working Days of the bid opening, written notice from the Bidder which shows proof of honest, credible, clerical error of a material nature, free from fraud or fraudulent intent; and of evidence that reasonable care was observed in the preparation of the Bid.
- 22.5.** A bidder who is not selected for contract award may protest the award of a contract to another bidder by submitting a written protest in accordance with the San Diego Municipal Code.
- 22.6.** The City of San Diego will not discriminate in the award of contracts with regard to race, religion creed, color, national origin, ancestry, physical handicap, marital status, sex or age.
- 22.7.** Each Bid package properly signed as required by these specifications shall constitute a firm offer which may be accepted by the City within the time specified herein.
- 22.8.** The City reserves the right to evaluate all Bids and determine the lowest Bidder on the basis of the base bid and any proposed alternates or options as detailed herein.

23. BID RESULTS:

- 23.1.** The availability of the bids on the City's eBidding system shall constitute the public announcement of the apparent low bidder. In the event that the apparent low bidder is subsequently deemed non-responsive or non-responsible, a notation of such will be made on the eBidding system. The new ranking and apparent low bidder will be adjusted accordingly.
- 23.2.** To obtain the bid results, view the results on the City's web site, or request the results by U.S. mail and provide a self-addressed, stamped envelope. If requesting by mail, be sure to reference the bid name and number. The bid tabulations will be mailed to you upon their completion. The results will not be given over the telephone.

24. THE CONTRACT:

- 24.1.** The Bidder to whom award is made shall execute a written contract with the City of San Diego and furnish good and approved bonds and insurance certificates specified by the City within 14 days after receipt by Bidder of a form of contract for execution unless an extension of time is granted to the Bidder in writing.
- 24.2.** If the Bidder takes longer than 14 days to fulfill these requirements, then the additional time taken shall be added to the Bid guarantee. The Contract shall be made in the form adopted by the City, which includes the provision that no claim or suit whatsoever shall be made or brought by Contractor against any officer, agent, or employee of the City for or on account of anything done or omitted to be done in connection with this contract, nor shall any such officer, agent, or employee be liable hereunder.
- 24.3.** If the Bidder to whom the award is made fails to enter into the contract as herein provided, the award may be annulled and the Bidder's Guarantee of Good Faith will be subject to forfeiture. An award may be made to the next lowest responsible and reliable Bidder who shall fulfill every stipulation embraced herein as if it were the party to whom the first award was made.
- 24.4.** Pursuant to the San Diego City Charter section 94, the City may only award a public works contract to the lowest responsible and reliable Bidder. The City will require the Apparent Low Bidder to (i) submit information to determine the Bidder's responsibility and reliability, (ii) execute the Contract in form provided by the City, and (iii) furnish good and approved bonds and insurance certificates specified by the City within 14 Days, unless otherwise approved by the City, in writing after the Bidder receives notification from the City, designating the Bidder as the Apparent Low Bidder and formally requesting the above mentioned items.
- 24.5.** The award of the Contract is contingent upon the satisfactory completion of the above-mentioned items and becomes effective upon the signing of the Contract by the Mayor or designee and approval as to form the City Attorney's Office. If the Apparent Low Bidder does not execute the Contract or submit required documents and information, the City may award the Contract to the next lowest responsible and reliable Bidder who shall fulfill every condition precedent to award. A corporation designated as the Apparent Low Bidder shall furnish evidence of its corporate existence and evidence that the officer signing the Contract and bond for the corporation is duly authorized to do so.

- 25. EXAMINATION OF PLANS, SPECIFICATIONS, AND SITE OF WORK:** The Bidder shall examine carefully the Project Site, the Plans and Specifications, other materials as described in the Special Provisions, Section 2-7, and the proposal forms (e.g., Bidding Documents). The submission of a Bid shall be conclusive evidence that the Bidder has investigated and is satisfied as to the conditions to be encountered, as to the character,

quality, and scope of Work, the quantities of materials to be furnished, and as to the requirements of the Bidding Documents Proposal, Plans, and Specifications.

26. CITY STANDARD PROVISIONS: This contract is subject to the following standard provisions. See The WHITEBOOK for details.

26.1. The City of San Diego Resolution No. R-277952 adopted on May 20, 1991 for a Drug-Free Workplace.

26.2. The City of San Diego Resolution No. R-282153 adopted on June 14, 1993 related to the Americans with Disabilities Act.

26.3. The City of San Diego Municipal Code §22.3004 for Contractor Standards.

26.4. The City of San Diego's Labor Compliance Program and the State of California Labor Code §§1771.5(b) and 1776.

26.5. Sections 1777.5, 1777.6, and 1777.7 of the State of California Labor Code concerning the employment of apprentices by contractors and subcontractors performing public works contracts.

26.6. The City's Equal Benefits Ordinance (EBO), Chapter 2, Article 2, Division 43 of The San Diego Municipal Code (SDMC).

26.7. The City's Information Security Policy (ISP) as defined in the City's Administrative Regulation 90.63.

27. PRE-AWARD ACTIVITIES:

27.1. The contractor selected by the City to execute a contract for this Work shall submit the required documentation as specified in the herein and in the Notice of Award. Failure to provide the information as specified may result in the Bid being rejected as **non-responsive**.

27.2. The decision that bid is non-responsive for failure to provide the information required within the time specified shall be at the sole discretion of the City.

PERFORMANCE BOND, LABOR AND MATERIALMEN'S BOND

FAITHFUL PERFORMANCE BOND AND LABOR AND MATERIALMEN'S BOND:

SCW Contracting Corporation, a corporation, as principal, and LIBERTY MUTUAL INSURANCE COMPANY, a corporation authorized to do business in the State of California, as Surety, hereby obligate themselves, their successors and assigns, jointly and severally, to The City of San Diego a municipal corporation in the sum of **One Million Four Hundred Ninety Seven Thousand One Hundred Ninety Three Dollars and Zero Cents (\$1,497,193.00)** for the faithful performance of the annexed contract, and in the sum of **One Million Four Hundred Ninety Seven Thousand One Hundred Ninety Three Dollars and Zero Cents (\$1,497,193.00)** for the benefit of laborers and materialmen designated below.

Conditions:

If the Principal shall faithfully perform the annexed contract with the City of San Diego, California, then the obligation herein with respect to a faithful performance shall be void; otherwise it shall remain in full force.

If the Principal shall promptly pay all persons, firms and corporations furnishing materials for or performing labor in the execution of this contract, and shall pay all amounts due under the California Unemployment Insurance Act then the obligation herein with respect to laborers and materialmen shall be void; otherwise it shall remain in full force.

The obligation herein with respect to laborers and materialmen shall inure to the benefit of all persons, firms and corporations entitled to file claims under the provisions of Article 2. Claimants, (iii) public works of improvement commencing with Civil Code Section 9100 of the Civil Code of the State of California.

Changes in the terms of the annexed contract or specifications accompanying same or referred to therein shall not affect the Surety's obligation on this bond, and the Surety hereby waives notice of same.

The Surety shall pay reasonable attorney's fees should suit be brought to enforce the provisions of this bond.

PERFORMANCE BOND, LABOR AND MATERIALMEN'S BOND (continued)

Dated JUNE 16, 2017

Approved as to Form

SCW CONTRACTING CORPORATION

Principal

By 

JEFFREY SCRAPE, PRESIDENT

Printed Name of Person Signing for Principal

Mara W. Elliott, City Attorney

By 

Deputy City Attorney

LIBERTY MUTUAL INSURANCE COMPANY

Surety

By 

MARK D. IATAROLA

Attorney-in-fact

ATTN: SURETY CLAIMS DEPARTMENT
1001 4TH AVENUE, SUITE 1300

Local Address of Surety

Approved:

By 

Stephen Samara
Principal Contract Specialist
Public Works Department

SEATTLE, WA 98154

Local Address (City, State) of Surety

714/634-5728

Local Telephone No. of Surety

Premium \$ 15,087.00

PREMIUM IS FOR CONTRACT TERM
AND IS SUBJECT TO ADJUSTMENT
BASED ON FINAL CONTRACT PRICE

Bond No. 024070678

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.

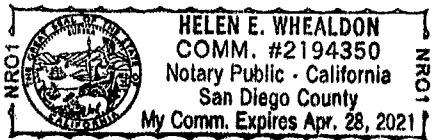
State of California)
County of SAN DIEGO)

On 6/16/2017 before me, HELEN E. WHEALDON, NOTARY PUBLIC
Date Here Insert Name and Title of the Officer
personally appeared MARK D. IATAROLA
Name(s) of Signer(s)

who 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 Helen E Whealdon
Signature of Notary Public

Place Notary Seal Above

OPTIONAL

Though this section is optional, completing this information can deter alteration of the document or fraudulent reattachment of this form to an unintended document.

Description of Attached Document

Title or Type of Document: _____ Document Date: _____
Number of Pages: _____ Signer(s) Other Than Named Above: _____

Capacity(ies) Claimed by Signer(s)

Signer's Name: MARK D. IATAROLA
 Corporate Officer — Title(s): _____
 Partner — Limited General
 Individual Attorney in Fact
 Trustee Guardian or Conservator
 Other: _____
Signer Is Representing: _____

Signer's Name: _____
 Corporate Officer — Title(s): _____
 Partner — Limited General
 Individual Attorney in Fact
 Trustee Guardian or Conservator
 Other: _____
Signer Is Representing: _____

THIS POWER OF ATTORNEY IS NOT VALID UNLESS IT IS PRINTED ON RED BACKGROUND.

This Power of Attorney limits the acts of those named herein, and they have no authority to bind the Company except in the manner and to the extent herein stated.

Certificate No. 7786771

Liberty Mutual Insurance Company
The Ohio Casualty Insurance Company West American Insurance Company

POWER OF ATTORNEY

KNOWN ALL PERSONS BY THESE PRESENTS: That The Ohio Casualty Insurance Company is a corporation duly organized under the laws of the State of New Hampshire, that Liberty Mutual Insurance Company is a corporation duly organized under the laws of the State of Massachusetts, and West American Insurance Company is a corporation duly organized under the laws of the State of Indiana (herein collectively called the "Companies"), pursuant to and by authority herein set forth, does hereby name, constitute and appoint, Helen Maloney; John G. Maloney; Mark D. Iatarola; Michelle M. Basuil; Sandra Figueroa

all of the city of Escondido, state of CA each individually if there be more than one named, its true and lawful attorney-in-fact to make, execute, seal, acknowledge and deliver, for and on its behalf as surety and as its act and deed, any and all undertakings, bonds, recognizances and other surety obligations, in pursuance of these presents and shall be as binding upon the Companies as if they have been duly signed by the president and attested by the secretary of the Companies in their own proper persons.

IN WITNESS WHEREOF, this Power of Attorney has been subscribed by an authorized officer or official of the Companies and the corporate seals of the Companies have been affixed thereto this 1st day of June, 2017.



The Ohio Casualty Insurance Company
Liberty Mutual Insurance Company
West American Insurance Company

By: David M. Carey
David M. Carey, Assistant Secretary

STATE OF PENNSYLVANIA ss
COUNTY OF MONTGOMERY

On this 1st day of June, 2017, before me personally appeared David M. Carey, who acknowledged himself to be the Assistant Secretary of Liberty Mutual Insurance Company, The Ohio Casualty Company, and West American Insurance Company, and that he, as such, being authorized so to do, execute the foregoing instrument for the purposes therein contained by signing on behalf of the corporations by himself as a duly authorized officer.

IN WITNESS WHEREOF, I have hereunto subscribed my name and affixed my notarial seal at King of Prussia, Pennsylvania, on the day and year first above written.



COMMONWEALTH OF PENNSYLVANIA
Notarial Seal
Teresa Pastella, Notary Public
Upper Merion Twp., Montgomery County
My Commission Expires March 28, 2021
Member, Pennsylvania Association of Notaries

By: Teresa Pastella
Teresa Pastella, Notary Public

This Power of Attorney is made and executed pursuant to and by authority of the following By-laws and Authorizations of The Ohio Casualty Insurance Company, Liberty Mutual Insurance Company, and West American Insurance Company which resolutions are now in full force and effect reading as follows:

ARTICLE IV – OFFICERS – Section 12. Power of Attorney. Any officer or other official of the Corporation authorized for that purpose in writing by the Chairman or the President, and subject to such limitation as the Chairman or the President may prescribe, shall appoint such attorneys-in-fact, as may be necessary to act in behalf of the Corporation to make, execute, seal, acknowledge and deliver as surety any and all undertakings, bonds, recognizances and other surety obligations. Such attorneys-in-fact, subject to the limitations set forth in their respective powers of attorney, shall have full power to bind the Corporation by their signature and execution of any such instruments and to attach thereto the seal of the Corporation. When so executed, such instruments shall be as binding as if signed by the President and attested to by the Secretary. Any power or authority granted to any representative or attorney-in-fact under the provisions of this article may be revoked at any time by the Board, the Chairman, the President or by the officer or officers granting such power or authority.

ARTICLE XIII – Execution of Contracts – SECTION 5. Surety Bonds and Undertakings. Any officer of the Company authorized for that purpose in writing by the chairman or the president, and subject to such limitations as the chairman or the president may prescribe, shall appoint such attorneys-in-fact, as may be necessary to act in behalf of the Company to make, execute, seal, acknowledge and deliver as surety any and all undertakings, bonds, recognizances and other surety obligations. Such attorneys-in-fact subject to the limitations set forth in their respective powers of attorney, shall have full power to bind the Company by their signature and execution of any such instruments and to attach thereto the seal of the Company. When so executed such instruments shall be as binding as if signed by the president and attested by the secretary.

Certificate of Designation – The President of the Company, acting pursuant to the Bylaws of the Company, authorizes David M. Carey, Assistant Secretary to appoint such attorneys-in-fact as may be necessary to act on behalf of the Company to make, execute, seal, acknowledge and deliver as surety any and all undertakings, bonds, recognizances and other surety obligations.

Authorization – By unanimous consent of the Company's Board of Directors, the Company consents that facsimile or mechanically reproduced signature of any assistant secretary of the Company, wherever appearing upon a certified copy of any power of attorney issued by the Company in connection with surety bonds, shall be valid and binding upon the Company with the same force and effect as though manually affixed.

I, Renee C. Llewellyn, the undersigned, Assistant Secretary, The Ohio Casualty Insurance Company, Liberty Mutual Insurance Company, and West American Insurance Company do hereby certify that the original power of attorney of which the foregoing is a full, true and correct copy of the Power of Attorney executed by said Companies, is in full force and effect and has not been revoked.

IN TESTIMONY WHEREOF, I have hereunto set my hand and affixed the seals of said Companies this 16TH day of JUNE, 2017.



By: Renee C. Llewellyn
Renee C. Llewellyn, Assistant Secretary

Not valid for mortgage, note, loan, letter of credit, currency rate, interest rate or residual value guarantees.

To confirm the validity of this Power of Attorney call 1-610-832-8240 between 9:00 am and 4:30 pm EST on any business day.

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 San Diego)

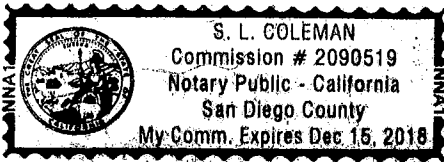
On _____ before me, S.L. Coleman, Notary Public,
Date Here Insert Name and Title of the Officer

personally appeared Jeffrey Scrape
Name(s) of Signer(s)

who 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 [Signature]
Signature of Notary Public

Place Notary Seal Above

OPTIONAL

Though this section is optional, completing this information can deter alteration of the document or fraudulent reattachment of this form to an unintended document.

Description of Attached Document

Title or Type of Document: Perf. Bond, Labor & Mat'ls Document Date: June 16, 2017

Number of Pages: 2 Signer(s) Other Than Named Above: _____

Capacity(ies) Claimed by Signer(s)

Signer's Name: Jeffrey Scrape

Corporate Officer — Title(s): President

Partner — Limited General

Individual Attorney in Fact

Trustee Guardian or Conservator

Other: _____

Signer Is Representing: _____

SCW Contracting Corporation

Signer's Name: _____

Corporate Officer — Title(s): _____

Partner — Limited General

Individual Attorney in Fact

Trustee Guardian or Conservator

Other: _____

Signer Is Representing: _____

ATTACHMENTS

ATTACHMENT A
SCOPE OF WORK

SCOPE OF WORK

1. **SCOPE OF WORK:** Sewer Pump Station 23T improvements including replacing existing pumps and motors, suction pipes and influent sluice gate, providing wet well ventilation and odor control, dry well ventilation upgrades, upgrading electrical fixtures, and removing dry well electrical panels and other items in accordance with the contract documents.
 - 1.1. The Work shall be performed in accordance with:
 - 1.1.1. The Notice Inviting Bids and Plans numbered **38992-01-D** through **38992-41-D**, inclusive.
2. **ESTIMATED CONSTRUCTION COST:** The City's estimated construction cost for this project is **\$1,400,000**.
3. **LOCATION OF WORK: The location of the Work is as follows:**

See Appendix E - Location Map.
4. **CONTRACT TIME:** The Contract Time for completion of the Work shall be **271 Working Days**.
 - 4.1. **CONTRACTOR'S LICENSE CLASSIFICATION:** In accordance with the provisions of California Law, the Contractor shall possess valid, appropriate license at the time that the Bid is submitted. Failure to possess the specified license(s) may render the Bid as **non-responsive** and ineligible for award.
 - 4.2. The City has determined that the following licensing classification is required for this contract:
 - **CLASS A**

ATTACHMENT B
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ATTACHMENT C
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ATTACHMENT D
PREVAILING WAGES

PREVAILING WAGES

1. **PREVAILING WAGE RATES:** Pursuant to San Diego Municipal Code section 22.3019, construction, alteration, demolition, repair and maintenance work performed under this Contract is subject to State prevailing wage laws. For construction work performed under this Contract cumulatively exceeding \$25,000 and for alteration, demolition, repair and maintenance work performed under this Contract cumulatively exceeding \$15,000, the Contractor and its subcontractors shall comply with State prevailing wage laws including, but not limited to, the requirements listed below.
 - 1.1. **Compliance with Prevailing Wage Requirements.** Pursuant to sections 1720 through 1861 of the California Labor Code, the Contractor and its subcontractors shall ensure that all workers who perform work under this Contract are paid not less than the prevailing rate of per diem wages as determined by the Director of the California Department of Industrial Relations (DIR). This includes work performed during the design and preconstruction phases of construction including, but not limited to, inspection and land surveying work.
 - 1.1.1. Copies of such prevailing rate of per diem wages are on file at the City and are available for inspection to any interested party on request. Copies of the prevailing rate of per diem wages also may be found at <http://www.dir.ca.gov/OPRL/DPreWageDetermination.htm>. Contractor and its subcontractors shall post a copy of the prevailing rate of per diem wages determination at each job site and shall make them available to any interested party upon request.
 - 1.1.2. The wage rates determined by the DIR refer to expiration dates. If the published wage rate does not refer to a predetermined wage rate to be paid after the expiration date, then the published rate of wage shall be in effect for the life of this Contract. If the published wage rate refers to a predetermined wage rate to become effective upon expiration of the published wage rate and the predetermined wage rate is on file with the DIR, such predetermined wage rate shall become effective on the date following the expiration date and shall apply to this Contract in the same manner as if it had been published in said publication. If the predetermined wage rate refers to one or more additional expiration dates with additional predetermined wage rates, which expiration dates occur during the life of this Contract, each successive predetermined wage rate shall apply to this Contract on the date following the expiration date of the previous wage rate. If the last of such predetermined wage rates expires during the life of this Contract, such wage rate shall apply to the balance of the Contract.
 - 1.2. **Penalties for Violations.** Contractor and its subcontractors shall comply with California Labor Code section 1775 in the event a worker is paid less than the prevailing wage rate for the work or craft in which the worker is employed.

- 1.3. Payroll Records.** Contractor and its subcontractors shall comply with California Labor Code section 1776, which generally requires keeping accurate payroll records, verifying and certifying payroll records, and making them available for inspection. Contractor shall require its subcontractors to also comply with section 1776. Contractor and its subcontractors shall submit weekly certified payroll records online via the City's web-based Labor Compliance Program. Contractor is responsible for ensuring its subcontractors submit certified payroll records to the City.
- 1.3.1.** For contracts entered into on or after April 1, 2015, Contractor and their subcontractors shall furnish records specified in Labor Code section 1776 directly to the Labor Commissioner in the manner required by Labor Code section 1771.4.
- 1.4. Apprentices.** Contractor and its subcontractors shall comply with California Labor Code sections 1777.5, 1777.6 and 1777.7 concerning the employment and wages of apprentices. Contractor is held responsible for the compliance of their subcontractors with sections 1777.5, 1777.6 and 1777.7.
- 1.5. Working Hours.** Contractor and their subcontractors shall comply with California Labor Code sections 1810 through 1815, including but not limited to: (i) restrict working hours on public works contracts to eight hours a day and forty hours a week, unless all hours worked in excess of 8 hours per day are compensated at not less than 1½ times the basic rate of pay; and (ii) specify penalties to be imposed on design professionals and subcontractors of \$25 per worker per day for each day the worker works more than 8 hours per day and 40 hours per week in violation of California Labor Code sections 1810 through 1815.
- 1.6. Required Provisions for Subcontracts.** Contractor shall include at a minimum a copy of the following provisions in any contract they enter into with a subcontractor: California Labor Code sections 1771, 1771.1, 1775, 1776, 1777.5, 1810, 1813, 1815, 1860 and 1861.
- 1.7. Labor Code Section 1861 Certification.** Contractor in accordance with California Labor Code section 3700 is required to secure the payment of compensation of its employees and by signing this Contract, Contractor certifies that "I am aware of the provisions of Section 3700 of the California Labor Code which require every employer to be insured against liability for workers' compensation or to undertake self-insurance in accordance with the provisions of that code, and I will comply with such provisions before commencing the performance of the work of this Contract."
- 1.8. Labor Compliance Program.** The City has its own Labor Compliance Program authorized in August 2011 by the DIR. The City will withhold contract payments when payroll records are delinquent or deemed inadequate by the City or other governmental entity, or it has been established after an investigation by the City or other governmental entity that underpayment(s) have occurred. For questions or assistance, please contact the City of San Diego's Equal Opportunity Contracting Department at 619-236-6000.

1.9. Contractor and Subcontractor Registration Requirements. This project is subject to compliance monitoring and enforcement by the DIR. As of March 1, 2015, no contractor or subcontractor may be listed on a bid or proposal for a public works project unless registered with the DIR pursuant to Labor Code section 1725.5. As of April 1, 2015, a contractor or subcontractor shall not be qualified to bid on, be listed in a bid proposal, or enter into any contract for public work, unless currently registered and qualified to perform public work pursuant to Labor Code section 1725.5. By submitting a bid or proposal to the City, Contractor is certifying that he or she has verified that all subcontractors used on this public work project are registered with the DIR in compliance with Labor Code sections 1771.1 and 1725.5, and Contractor shall provide proof of registration to the City upon request.

1.9.1. A Contractor's inadvertent error in listing a subcontractor who is not registered pursuant to Labor Code section 1725.5 in response to a solicitation shall not be grounds for filing a bid protest or grounds for considering the bid non-responsive provided that any of the following apply: (1) the subcontractor is registered prior to bid opening; (2) within twenty-four hours after the bid opening, the subcontractor is registered and has paid the penalty registration fee specified in Labor Code section 1725.5; or (3) the subcontractor is replaced by another registered subcontractor pursuant to Public Contract Code section 4107.

ATTACHMENT E
SUPPLEMENTARY SPECIAL PROVISIONS

SUPPLEMENTARY SPECIAL PROVISIONS

The following Supplementary Special Provisions (SSP) modifies the following documents:

1. The **2015 Edition** of the Standard Specifications for Public Works Construction (The "GREENBOOK").
2. The **2015 Edition** of the City of San Diego Standard Specifications for Public Works Construction (The "WHITEBOOK"), including the following:
 - a) General Provisions (A) for all Contracts.

SECTION 1 – TERMS, DEFINITIONS, ABBREVIATIONS, UNITS OF MEASURE, AND SYMBOLS

- 1-2 TERMS AND DEFINITIONS.** To the "WHITEBOOK", item 54, "Normal Working Hours", ADD the following:

The **Normal Working Hours** are 7:00 AM to 3:30 PM.

SECTION 2 - SCOPE AND CONTROL OF WORK

- 2-3.2 Self Performance.** To the "GREENBOOK", DELETE in its entirety and SUBSTITUTE with the following:

1. You shall perform, with your own organization, Contract Work amounting to at least 50% of the base Bid **AND** 50% of any alternates.

- 2-7 SUBSURFACE DATA.** To the "WHITEBOOK ", ADD the following:

4. In preparation of the Contract Documents, the designer has relied upon the following reports of explorations and tests of subsurface conditions at the Work Site:
 - a) Geotechnical Engineering Investigation for Otay Mesa Wastewater Transmission System dated January 1984 by Geocon, Incorporated.
 - b) Otay Mesa Wastewater Transmission System Phases IC, ID In-Place Density Test Results dated January 29, 1987 by Geocon, Incorporated.
5. The reports listed above are available for review by contacting the Contract Specialist or visiting:

<ftp://ftp.sannet.gov/OUT/ECP/SPS%2023T/>

2-16 **CONTRACTOR REGISTRATION AND ELECTRONIC REPORTING SYSTEM.** To the "WHITEBOOK", item 1, DELETE in its entirety.

SECTION 3 – CHANGES IN WORK

3-5.1 **Claims.** To the "WHITEBOOK", DELETE in its entirety and SUBSTITUTE with the following:

ADD:

3-5.1 **Claims.**

1. A Claim is a written demand by you that seeks an adjustment in the Contract Price, Contract Time, or other relief associated with a dispute arising under or relating to the Contract, including a breach of any provision thereof. A voucher, invoice, or other routine request for payment is not a Claim.
2. A Claim shall conform to these specifications and may be considered after the City has previously denied a request by you for a Change Order seeking the demanded relief.
3. You shall submit a Claim to the Engineer if a dispute occurs that arises from or relates to the Contract. The Claim shall seek all relief to which you assert you are entitled as a result of the event(s) giving rise to the dispute. Your failure to process a Claim in accordance with these specifications shall constitute a waiver of all relief associated with the dispute. Claims are subject to 6-11, "Right to Audit".
4. You shall continue to perform the Services and Work and shall maintain the Schedule during any dispute proceedings. The Engineer will continue to make payments for undisputed Services and Work.
5. The City's Claims process specified herein shall not relieve you of your statutory obligations to present claims prior to any action under the California Government Code.

3-5.1.1 **Initiation of Claim.**

1. You shall promptly, but no later than 30 Days after the event(s) giving rise to the Claim, deliver the Claim to the Engineer.
2. You shall not process a Claim unless the Engineer has previously denied a request by you for a Change Order that sought the relief to be pursued in the claim.

3-5.1.1.1 Claim Certification Submittal.

1. If your Claim seeks an increase in the Contract Price, the Contract Time, or both, submit with the Claim an affidavit certifying the following:
 - a) The Claim is made in good faith and covers all costs and delays to which you are entitled as a result of the event(s) giving rise to the Claim.
 - b) The amount claimed accurately reflects the adjustments in the Contract Price, the Contract Time, or both to which you believe you are entitled.
 - c) All supporting costs and pricing data are current, accurate, and complete to the best of your knowledge. The cost breakdown per item of Work shall be supplied.
 - d) You shall ensure that the affidavit is executed by an official who has the authority to legally bind you.

3-5.1.2 Initial Determination.

1. The Engineer will respond in writing to your Claim within 30 Days of receipt of the Claim.

3-5.1.3 Settlement Meeting.

1. If you disagree with the Initial Determination, you shall request a Settlement Meeting within 30 Days. Upon receipt of this request, the Engineer will schedule the Settlement Meeting within 15 Working Days.

3-5.1.7 City's Final Determination.

1. If a settle agreement is not reached, the City shall make a written Final Determination within 10 Working Days after the Settlement Meeting.
2. If you disagree with the City's Final Determination, notify the Engineer in writing of your objection within 15 Working Days after receipt of the written determination and file a "Request for Mediation" in accordance with 3-5.2, "Dispute Resolution Process".
3. Failure to give notice of objection within the 15 Working Days period shall waive your right to pursue the Claim.

3-5.1.8 Mandatory Assistance.

1. If a third party dispute, litigation, or both arises out of or relates in any way to the Services provided under the Contract, upon the City's request, you shall

agree to assist in resolving the dispute or litigation. Your assistance includes, but is not limited to the following:

- a) Providing professional consultations.
- b) Attending mediations, arbitrations, depositions, trials, or any event related to the dispute resolution and litigation.

3-5.1.8.1 Compensation for Mandatory Assistance.

1. The City will reimburse you for reasonable fees and expenses incurred by you for any required assistance rendered in accordance with 3-5.1.8, "Mandatory Assistance" as Extra Work.
2. The Engineer will determine whether these fees and expenses were necessary due to your conduct or failure to act.
3. If the Engineer determines that the basis of the dispute or litigation in which these fees and expenses were incurred were the result of your conduct or your failure to act in part or in whole, you shall reimburse the City for any payments made for these fees and expenses.
4. Reimbursement may be through any legal means necessary, including the City's withholding of your payment.

3-5.2.3 Selection of Mediator. To the "WHITEBOOK", DELETE in its entirety and SUBSTITUTE with the following:

1. A single mediator, knowledgeable in construction aspects and acceptable to both parties, shall be used to mediate the dispute.
2. To initiate mediation, the initiating party shall serve a Request for Mediation at the American Arbitration Association (AAA) on the opposing party.
3. If AAA is used, the initiating party shall concurrently file with AAA a "Request for Mediation" along with the appropriate fees, a copy of requested mediators marked in preference order, and a preference for available dates.
4. If AAA is selected to coordinate the mediation (Administrator), within 10 Working Days from the receipt of the initiating party's Request for Mediation, the opposing party shall file the following:
 - a) A copy of the list of the preferred mediators listed in preference order after striking any mediators to which they have any objection.
 - b) A preference for available dates.
 - c) Appropriate fees.

5. If the parties cannot agree on a mediator, then each party shall select a mediator and those mediators shall select the neutral third party to mediate the matter.

3-5.3 Forum of Litigation. To the "WHITEBOOK", DELETE in its entirety and SUBSTITUTE with the following:

1. It is the express intention that all legal actions and proceedings related to the Contract or Agreement with the City or to any rights or any relationship between the parties arising therefrom shall be solely and exclusively initiated and maintained in courts of the State of California for the County of San Diego.

SECTION 4 - CONTROL OF MATERIALS

4-1.3.4 Inspection Paid For by the Contractor. To the WHITEBOOK", ADD the following:

1. The special inspections required are listed as follows:
 - a) The required special inspections of the building permit issued by Development Services Department.

4-1.3.5 Special Inspection. To the "WHITEBOOK", ADD the following:

5. The payment for special inspection Work specified under this section shall be paid in accordance with 4-1.3.4.1, "Payment".

4-1.3.6 Preapproved Materials. To the "WHITEBOOK", ADD the following:

3. You shall submit in writing a list of all products to be incorporated in the Work that are on the AML.

4-1.6 Trade Names or Equals. To the "WHITEBOOK", ADD the following:

11. Substitutions for an "equal" or "equivalent" product shall comply with the attached technical specifications as listed under Technical Specification Section 01 60 00.

SECTION 5 - UTILITIES

5-2 PROTECTION. To the "WHITEBOOK", item 2, ADD the following:

- g) Refer to **Appendix F** for more information on the protection of AMI devices.

SECTION 6 - PROSECUTION, PROGRESS AND ACCEPTANCE OF WORK

ADD:

6-3.2.1.1 Environmental Document.

1. The City of San Diego Public Works Department has prepared a **Notice of Exemption** for **Sewer Pump Station 23T Improvements, Project No. B-14131**, as referenced in the Contract Appendix. You shall comply with all requirements of the Notice of Exemption as set forth in **Appendix A**.
2. Compliance with the City's environmental document shall be included in the Contract Price.

6-7.1 General. To the "WHITEBOOK", item 3, ADD the following:

- d) 30 Days for full depth asphalt final mill and resurfacing work required per SDG-107.

SECTION 7 - RESPONSIBILITIES OF THE CONTRACTOR

7-3 INSURANCE. To the "GREENBOOK", DELETE in its entirety and SUBSTITUTE with the following:

7-3 INSURANCE.

1. The insurance provisions herein shall not be construed to limit your indemnity obligations contained in the Contract.

7-3.1 Policies and Procedures.

1. You shall procure the insurance described below, at its sole cost and expense, to provide coverage against claims for loss including injuries to persons or damage to property, which may arise out of or in connection with the performance of the Work by you, your agents, representatives, officers, employees or Subcontractors.
2. Insurance coverage for property damage resulting from your operations is on a replacement cost valuation. The market value will not be accepted.
3. You shall maintain this insurance for the duration of this Contract and at all times thereafter when you are correcting, removing, or replacing Work in accordance with this Contract. Your liabilities under the Contract, e.g., your indemnity obligations, is not deemed limited to the insurance coverage required by this Contract.

4. The payment for insurance shall be included in the Contract Price as bid by you. Except as specifically agreed to by the City in writing, you are not entitled to any additional payment. Do not begin any Work under this Contract until you have provided and the City has approved all required insurance.
5. Policies of insurance shall provide that the City is entitled to 30 Days (10 Days for cancellation due to non-payment of premium) prior written notice of cancellation or non-renewal of the policy. Maintenance of specified insurance coverage is a material element of the Contract. Your failure to maintain or renew coverage or to provide evidence of renewal during the term of the Contract may be treated by the City as a material breach of the Contract.

7-3.2 Types of Insurance.

7-3.2.1 Commercial General Liability Insurance.

1. Commercial General Liability Insurance shall be written on the current version of the ISO Occurrence form CG 00 01 07 98 or an equivalent form providing coverage at least as broad.
2. The policy shall cover liability arising from premises and operations, XCU (explosions, underground, and collapse), independent contractors, products/completed operations, personal injury and advertising injury, bodily injury, property damage, and liability assumed under an insured's contract (including the tort liability of another assumed in a business contract).
3. There shall be no endorsement or modification limiting the scope of coverage for either "insured vs. insured" claims or contractual liability. You shall maintain the same or equivalent insurance for at least 10 years following completion of the Work.
4. All costs of defense shall be outside the policy limits. Policy coverage shall be in liability limits of not less than the following:

<u>General Annual Aggregate Limit</u>	<u>Limits of Liability</u>
Other than Products/Completed Operations	\$2,000,000
Products/Completed Operations Aggregate Limit	\$2,000,000
Personal Injury Limit	\$1,000,000
Each Occurrence	\$1,000,000

7-3.2.2 Commercial Automobile Liability Insurance.

1. You shall provide a policy or policies of Commercial Automobile Liability Insurance written on the current version of the ISO form CA 00 01 12 90 or later version or equivalent form providing coverage at least as broad in the

amount of \$1,000,000 combined single limit per accident, covering bodily injury and property damage for owned, non-owned, and hired automobiles ("Any Auto").

2. All costs of defense shall be outside the limits of the policy.

7-3.2.3 Contractors Pollution Liability Insurance.

1. You shall procure and maintain at your expense or require your Subcontractor, as described below, to procure and maintain the Contractors Pollution Liability Insurance including contractual liability coverage to cover liability arising out of cleanup, removal, storage, or handling of hazardous or toxic chemicals, materials, substances, or any other pollutants by you or any Subcontractor in an amount not less than \$2,000,000 limit for bodily injury and property damage.
2. All costs of defense shall be outside the limits of the policy. Any such insurance provided by your Subcontractor instead of you shall be approved separately in writing by the City.
3. For approval of a substitution of your Subcontractor's insurance, you shall certify that all activities for which the Contractors Pollution Liability Insurance will provide coverage will be performed exclusively by the Subcontractor providing the insurance. The deductible shall not exceed \$25,000 per claim.
4. Contractual liability shall include coverage of tort liability of another party to pay for bodily injury or property damage to a third person or organization. There shall be no endorsement or modification of the coverage limiting the scope of coverage for either "insured vs. insured" claims or contractual liability.
5. Occurrence based policies shall be procured before the Work commences and shall be maintained for the Contract Time. Claims Made policies shall be procured before the Work commences, shall be maintained for the Contract Time, and shall include a 12 month extended Claims Discovery Period applicable to this contract or the existing policy or policies that shall continue to be maintained for 12 months after the completion of the Work without advancing the retroactive date.
6. Except as provided for under California law, the policy or policies shall provide that the City is entitled to 30 Days prior written notice (10 Days for cancellation due to non-payment of premium) of cancellation or non-renewal of the policy or policies.

7-3.2.4 Contractors Hazardous Transporters Pollution Liability Insurance.

1. You shall provide at your expense or require your Subcontractor to provide, as described below, Contractors Hazardous Transporters Pollution Liability Insurance including contractual liability coverage to cover liability arising out

of transportation of hazardous or toxic, materials, substances, or any other pollutants by you or any Subcontractor in an amount not less than \$2,000,000 limit per occurrence/aggregate for bodily injury and property damage.

2. All costs of defense shall be outside the limits of the policy. The deductible shall not exceed \$25,000 per claim. Any such insurance provided by a subcontractor instead of you shall be approved separately in writing by the City.
3. For approval of the substitution of Subcontractor's insurance the Contractor shall certify that all activities for which Contractors Hazardous Transporters Pollution Liability Insurance will provide coverage will be performed exclusively by the Subcontractor providing the insurance.
4. Contractual liability shall include coverage of tort liability of another party to pay for bodily injury or property damage to a third person or organization. There shall be no endorsement or modification of the coverage limiting the scope of coverage for either "insured vs. insured" claims or contractual liability. Occurrence based policies shall be procured before the Work commences and shall be maintained for the duration of this Contract. Claims Made policies shall be procured before the Work commences, shall be maintained for the duration of this contract, and shall include a 12 month extended Claims Discovery Period applicable to this contract or the existing policy or policies that shall continue to be maintained for 12 months after the completion of the Work under this Contract without advancing the retroactive date.
5. Except as provided for under California law, the policy or policies shall provide that the City is entitled to 30 Days prior written notice (10 Days for cancellation due to non-payment of premium) of cancellation or non-renewal of the policy or policies.

7-3.2.5 Contractors Builder's Risk Property Insurance..

1. You shall provide at your expense, and maintain until Final Acceptance of the Work, a Special Form Builders Risk Policy or Policies. This insurance shall be in an amount equal to the replacement cost of the completed Work (without deduction for depreciation) including the cost of excavations, grading, and filling. The policy or policies limits shall be 100% of this Contract value of the Work plus 15% to cover administrative costs, design costs, and the costs of inspections and construction management.
2. Insured property shall include material or portions of the Work located away from the Site but intended for use at the Site and shall cover material or portions of the Work in transit. The policy or policies shall include as insured property scaffolding, falsework, and temporary buildings located at the Site. The policy or policies shall cover the cost of removing debris, including demolition.

3. The policy or policies shall provide that all proceeds thereunder shall be payable to the City as Trustee for the insured, and shall name the City, the Contractor, Subcontractors, and Suppliers of all tiers as named insured. The City, as Trustee, will collect, adjust, and receive all monies which may become due and payable under the policy or policies, may compromise any and all claims thereunder, and will apply the proceeds of such insurance to the repair, reconstruction, or replacement of the Work.
4. Any deductible applicable to the insurance shall be identified in the policy or policies documents and responsibility for paying the part of any loss not covered because of the application of such deductibles shall be apportioned among the parties except for the City as follows: if there is more than one claimant for a single occurrence, then each claimant shall pay a pro-rata share of the per occurrence deductible based upon the percentage of their paid claim to the total paid for insured. The City shall be entitled to 100% of its loss. You shall pay the City any portion of that loss not covered because of a deductible at the same time the proceeds of the insurance are paid to the City as trustee.
5. Any insured, other than the City, making claim to which a deductible applies shall be responsible for 100% of the loss not insured because of the deductible. Except as provided for under California law, the policy or policies shall provide that the City is entitled to 30 Days prior written notice (10 Days for cancellation due to non-payment of premium) of cancellation or non-renewal of the policy or policies.

7-3.3 Rating Requirements. Except for the State Compensation Insurance Fund, all insurance required by this Contract as described herein shall be carried only by responsible insurance companies with a rating of, or equivalent to, at least "A-, VI" by A.M. Best Company, that are authorized by the California Insurance Commissioner to do business in the State, and that have been approved by the City.

7-3.3.1 Non-Admitted Carriers. The City will accept insurance provided by non-admitted, "surplus lines" carriers only if the carrier is authorized to do business in the State and is included on the List of Approved Surplus Lines Insurers (LASLI list).

All policies of insurance carried by non-admitted carriers shall be subject to all of the requirements for policies of insurance provided by admitted carriers described herein.

7-3.4 Evidence of Insurance. Furnish to the City documents e.g., certificates of insurance and endorsements evidencing the insurance required herein, and furnish renewal documentation prior to expiration of this insurance. Each required document shall be signed by the insurer or a person authorized by the insurer to bind coverage on its behalf. We reserve the right to require complete, certified copies of all insurance policies required herein.

7-3.5 Policy Endorsements.

7-3.5.1 Commercial General Liability Insurance.

7-3.5.1.1 Additional Insured.

1. You shall provide at your expense policy endorsement written on the current version of the ISO Occurrence form CG 20 10 11 85 or an equivalent form providing coverage at least as broad.
2. To the fullest extent allowed by law e.g., California Insurance Code §11580.04, the policy shall be endorsed to include the City and its respective elected officials, officers, employees, agents, and representatives as additional insured.
3. The additional insured coverage for projects for which the Engineer's Estimate is \$1,000,000 or more shall include liability arising out of:
 - a) Ongoing operations performed by you or on your behalf,
 - b) your products,
 - c) your Work, e.g., your completed operations performed by you or on your behalf, or
 - d) premises owned, leased, controlled, or used by you.
4. The additional insured coverage for projects for which the Engineer's Estimate is less than \$1,000,000 shall include liability arising out of:
 - a) Ongoing operations performed by you or on your behalf,
 - b) your products, or
 - c) premises owned, leased, controlled, or used by you.

7-3.5.1.2 Primary and Non-Contributory Coverage. The policy shall be endorsed to provide that the coverage with respect to operations, including the completed operations, if appropriate, of the Named Insured is primary to any insurance or self-insurance of the City and its elected officials, officers, employees, agents and representatives. Further, it shall provide that any insurance maintained by the City and its elected officials, officers, employees, agents and representatives shall be in excess of your insurance and shall not contribute to it.

7-3.5.1.3 Project General Aggregate Limit. The policy or policies shall be endorsed to provide a Designated Construction Project General Aggregate Limit that will apply only to the Work. Only claims payments which arise from the Work shall reduce the Designated

Construction Project General Aggregate Limit. The Designated Construction Project General Aggregate Limit shall be in addition to the aggregate limit provided for the products-completed operations hazard.

7-3.5.2 Commercial Automobile Liability Insurance.

7-3.5.2.1 Additional Insured. Unless the policy or policies of Commercial Auto Liability Insurance are written on an ISO form CA 00 01 12 90 or a later version of this form or equivalent form providing coverage at least as broad, the policy shall be endorsed to include the City and its respective elected officials, officers, employees, agents, and representatives as additional insured, with respect to liability arising out of automobiles owned, leased, hired or borrowed by you or on your behalf. This endorsement is limited to the obligations permitted by California Insurance Code §11580.04.

7-3.5.3 Contractors Pollution Liability Insurance Endorsements.

7-3.5.3.1 Additional Insured.

1. The policy or policies shall be endorsed to include as an Insured the City and its respective elected officials, officers, employees, agents, and representatives, with respect to liability arising out of:
 - a) Ongoing operations performed by you or on your behalf,
 - b) your products,
 - c) your work, e.g., your completed operations performed by you or on your behalf, or
 - d) premises owned, leased, controlled, or used by you.

Except that in connection with, collateral to, or affecting any construction contract to which the provisions of subdivision (b) of § 2782 of the California Civil Code apply, this endorsement shall not provide any duty of indemnity coverage for the active negligence of the City and its respective elected officials, officers, employees, agents, and representatives in any case where an agreement to indemnify the City and its respective elected officials, officers, employees, agents, and representatives would be invalid under subdivision (b) of §2782 of the California Civil Code.

2. In any case where a claim or loss encompasses the negligence of the Insured and the active negligence of the City and its respective elected officials, officers, employees, agents, and representatives that are not covered because of California Insurance Code §11580.04, the insurer's obligation to the City and its respective elected officials, officers, employees, agents, and representatives

shall be limited to obligations permitted by California Insurance Code §11580.04.

7-3.5.3.2 Primary and Non-Contributory Coverage. The policy or policies shall be endorsed to provide that the insurance afforded by the Contractors Pollution Liability Insurance policy or policies is primary to any insurance or self-insurance of the City and its elected officials, officers, employees, agents and representatives with respect to operations including the completed operations of the Named Insured. Any insurance maintained by the City and its elected officials, officers, employees, agents and representatives shall be in excess of your insurance and shall not contribute to it.

7-3.5.3.3 Severability of Interest. For Contractors Pollution Liability Insurance, the policy or policies shall provide that your insurance shall apply separately to each insured against whom claim is made or suit is brought, except with respect to the limits of the insurer's liability and shall provide cross-liability coverage.

7-3.5.4 Contractors Hazardous Transporters Pollution Liability Insurance Endorsements.

7-3.5.4.1 Additional Insured.

1. The policy or policies shall be endorsed to include as an Insured the City and its respective elected officials, officers, employees, agents, and representatives, with respect to liability arising out of:
 - a) Ongoing operations performed by you or on your behalf,
 - b) your products,
 - c) your work, e.g., your completed operations performed by you or on your behalf, or
 - d) premises owned, leased, controlled, or used by you.

Except that in connection with, collateral to, or affecting any construction contract to which the provisions of subdivision (b) of §2782 of the California Civil Code apply, this endorsement shall not provide any duty of indemnity coverage for the active negligence of the City and its respective elected officials, officers, employees, agents, and representatives in any case where an agreement to indemnify the City and its respective elected officials, officers, employees, agents, and representatives would be invalid under subdivision (b) of §2782 of the California Civil Code.

2. In any case where a claim or loss encompasses the negligence of the Insured and the active negligence of the City and its respective elected officials, officers, employees, agents, and representatives that are not covered because of California Insurance Code §11580.04, the insurer's obligation to the City and

its respective elected officials, officers, employees, agents, and representatives shall be limited to obligations permitted by California Insurance Code §11580.04.

- 7-3.5.4.2 Primary and Non-Contributory Coverage.** The policy or policies shall be endorsed to provide that the insurance afforded by the Contractors Pollution Liability Insurance policy or policies is primary to any insurance or self-insurance of the City and its elected officials, officers, employees, agents and representatives with respect to operations including the completed operations of the Named Insured. Any insurance maintained by the City and its elected officials, officers, employees, agents and representatives shall be in excess of your insurance and shall not contribute to it.
- 7-3.5.4.3 Severability of Interest.** For Contractors Hazardous Transporters Pollution Liability Insurance, the policy or policies shall provide that your insurance shall apply separately to each insured against whom claim is made or suit is brought, except with respect to the limits of the insurer's liability and shall provide cross-liability coverage.
- 7-3.5.5 Builder's Risk Endorsements.**
- 7-3.5.5.1 Waiver of Subrogation.** The policy or policies shall be endorsed to provide that the insurer will waive all rights of subrogation against the City, and its respective elected officials, officers, employees, agents, and representatives for losses paid under the terms of the policy or policies and which arise from Work performed by the Named Insured for the City.
- 7-3.5.5.2 Builder's Risk – Partial Utilization.** If the City desires to occupy or use a portion or portions of the Work prior to Acceptance in accordance with this Contract, the City will notify you and you shall immediately notify your Builder's Risk insurer and obtain an endorsement that the policy or policies shall not be cancelled or lapse on account of any such partial use or occupancy. You shall obtain the endorsement prior to the City's occupation and use.
- 7-3.6 Deductibles and Self-Insured Retentions.** You shall pay for all deductibles and self-insured retentions. You shall disclose deductibles and self-insured retentions to the City at the time the evidence of insurance is provided.
- 7-3.7 Reservation of Rights.** The City reserves the right, from time to time, to review your insurance coverage, limits, deductibles and self-insured retentions to determine if they are acceptable to the City. The City will reimburse you, without overhead, profit, or any other markup, for the cost of additional premium for any coverage requested by the Engineer but not required by this Contract.

7-3.8 Notice of Changes to Insurance. You shall notify the City 30 Days prior to any material change to the policies of insurance provided under this Contract.

7-3.9 Excess Insurance. Policies providing excess coverage shall follow the form of the primary policy or policies e.g., all endorsements.

7-3.10 Architects and Engineers Professional Insurance (Errors and Omissions Insurance).

1. For Contracts with required engineering services (e.g., Design-Build, preparation of engineered Traffic Control Plans (TCP), and etc.) by you, you shall keep or require all of your employees or Subcontractors, who provide professional engineering services under this contract, Professional Liability coverage with a limit of **\$1,000,000** per claim and **\$2,000,000** annual aggregate in full force and effect.
2. You shall ensure the following:
 - a) The policy retroactive date is on or before the date of commencement of the Project.
 - b) The policy will be maintained in force for a period of 3 years after completion of the Project or termination of this Contract, whichever occurs last. You agree that for the time period specified above, there will be no changes or endorsements to the policy that affect the specified coverage.
3. If professional engineering services are to be provided solely by the Subcontractor, you shall:
 - a) Certify this to the City in writing and
 - b) Agree in writing to require the Subcontractor to procure Professional Liability coverage in accordance with the requirements set forth above.

7-4 NOT USED. To the "GREENBOOK", DELETE in its entirety and SUBSTITUTE with the following:

7-4 WORKERS' COMPENSATION INSURANCE AND EMPLOYERS LIABILITY INSURANCE.

1. In accordance with the provisions of §3700 of the California Labor Code, you shall provide at your expense Workers' Compensation Insurance and Employers Liability Insurance to protect you against all claims under applicable state workers compensation laws. The City, its elected officials, and employees will not be responsible for any claims in law or equity occasioned by your failure to comply with the requirements of this section.

2. Limits for this insurance shall be not less than the following:

<u>Workers' Compensation</u>	<u>Statutory Employers Liability</u>
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Bodily Injury by Accident	\$1,000,000 each accident
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Bodily Injury by Disease	\$1,000,000 each employee
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Bodily Injury by Disease	\$1,000,000 policy limit
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3. By signing and returning the Contract you certify that you are aware of the provisions of §3700 of the Labor Code which requires every employer to be insured against liability for worker's compensation or to undertake self-insurance in accordance with the provisions of that code and you shall comply with such provisions before commencing the Work as required by §1861 of the California Labor Code.

7-4.1. Waiver of Subrogation. The policy or policies shall be endorsed to provide that the insurer will waive all rights of subrogation against the City and its respective elected officials, officers, employees, agents, and representatives for losses paid under the terms of the policy or policies and which arise from Work performed by the Named Insured for the City.

7-8.6 Water Pollution Control. To the "WHITEBOOK", ADD the following:

6. Based on a preliminary assessment by the City, this Contract is subject to WPCP.

7-20 ELECTRONIC COMMUNICATION. To the "WHITEBOOK", ADD the following:

2. Virtual Project Manager shall be used on this Contract.

7-21.1 General. To the "WHITEBOOK", item 3, DELETE in its entirety and SUBSTITUTE with the following:

3. During the construction phase of projects, the minimum waste management reduction goal is 90% of the inert material (a material not subject to decomposition such as concrete, asphalt, brick, rock, block, dirt, metal, glass, and etc.) and 65% of the remaining project waste. You shall provide appropriate documentation, including a Waste Management Form attached as an appendix, and evidence of recycling and reuse of materials to meet the waste reduction goals specified.

7-22.20 Payment. To the "WHITEBOOK", ADD the following:

2. Payment for Lead Abatement shall be included in the Bid Item "Lead Abatement and Disposal".

SECTION 9 - MEASUREMENT AND PAYMENT

ADD:

9-3.7 Compensation Adjustments for Price Index Fluctuations. To the "WHITEBOOK", ADD the following:

5. This Contract is not subject to the provisions of The "WHITEBOOK" for Compensation Adjustments for Price Index Fluctuations for paving asphalt.

SECTION 203 – BITUMINOUS MATERIALS

203-3.4.4 RUBBER POLYMER MODIFIED SLURRY (RPMS). To the "WHITEBOOK", ADD the following:

1. RPMS shall be used on this Contract.

SECTION 209 – PRESSURE PIPE

209 PRESSURE PIPE. To the "WHITEBOOK", ADD the following:

2. PVC products, specifically type C900 and C905, as manufactured or distributed by J-M Manufacturing Company or JM Eagle shall not be used on the Contract for pressurized pipe.

209-1.1.2 Materials. To the "WHITEBOOK", item 10, ADD the following:

- a) The interior of bells shall be lined **as specified.**

SECTION 217 – BEDDING AND BACKFILL MATERIALS

217-2.2 Stones, Boulders, and Broken Concrete. To the "GREENBOOK", Table 217-2.2, DELETE in its entirety and SUBSTITUTE with the following:

TABLE 217-2.2

Zone	Zone Limits	Maximum Size (greatest dimension)	Backfill Requirements in Addition to 217-2.1
Street or Surface Zone	From ground surface to 12" (300 mm) below pavement <i>subgrade</i> or ground surface	2.5" (63 mm)	As required by the Plans or Special Provisions.
Street or Surface Zone Backfill of Tunnels beneath Concrete Flatwork		Sand	Sand equivalent of not less than 30.

Zone	Zone Limits	Maximum Size (greatest dimension)	Backfill Requirements in Addition to 217-2.1
Trench Zone	From 12" (300 mm) below pavement <i>subgrade</i> or ground surface to 12" (300 mm) above top of pipe or box	6" (150 mm)	
Deep Trench Zone (Trenches 3' (0.9 m) wide or wider)	From 60" (1.5 m) below finished surface to 12" (300 mm) above top of pipe or box	Rocks up to 12" (300 mm) excavated from trench may be placed as backfill	
Pipe Zone	From 12" (300 mm) above top of pipe or box to 6" (150 mm) below bottom of pipe or box exterior	2.5" (63 mm)	Sand equivalent of not less than 30 or a coefficient of permeability greater than 1-½ inches/hour (35 mm per hour).
Overexcavation	Backfill more than 6" (150 mm) below bottom of pipe or box exterior	6" (150 mm)	Sand equivalent of not less than 30 or a coefficient of permeability greater than 1-½ inches/hour (35 mm per hour). Trench backfill slurry (100-E-100) per 201-1 may also be used.

SECTION 302 – ROADWAY SURFACING

ADD:

302-4.12.2.1.1 Slurry Treatment.

1. When slurry treatment is required by the Contract Documents, notify the Engineer at least 10 Working Days prior to the first application of slurry. The Engineer, upon assessment of street condition and classification, will verify the slurry type to be applied.
2. Application of sequential layers of slurry shall not commence until approved by the Engineer and until the following have been completed:
 - a) Mix design and wet track abrasion testing for the first-step slurry application has been approved by the Engineer. Unless otherwise directed by the Engineer, this testing may require 4 Working Days from field sampling to reporting of test results to the Engineer.
 - b) Corrective actions have been executed in accordance with 302-4.11.1.2, "Reduction in Payment Based on WTAT" such as reductions in payment, non-payment, or removal of material not meeting specifications, as directed by the Engineer.

302-4.12.4 Measurement and Payment. To the "WHITEBOOK", item 2, Bid Description Table, DELETE in its entirety and SUBSTITUTE with the following:

2. Payment will be made at the Contract Unit Price for each type of slurry applied:

BID DESCRIPTION	UNIT
Rubber Polymer Modified Slurry (RPMS) Type I	SF
Rubber Polymer Modified Slurry (RPMS) Type II	SF
Rubber Polymer Modified Slurry (RPMS) Type III	SF
Rubber Polymer Modified Slurry (RPMS) Type I (Bike Lane)	SF

302-7.4 Payment. To the "WHITEBOOK", item 1, last sentence, DELETE in its entirety and SUBSTITUTE with the following:

Payment shall not be made for additional fabric for overlapped areas.

SECTION 304 –METAL FABRICATION AND CONSTRUCTION

304-5 PAYMENT. To the "WHITEBOOK ", REVISE section "304-5" to "304-6.

EQUAL OPPORTUNITY CONTRACTING PROGRAM (EOCP) SECTION A – GENERAL REQUIREMENTS

4.1 Nondiscrimination in Contracting Ordinance. To the "WHITEBOOK", subsection 4.1.1, paragraph (2), sentence (1), DELETE in its entirety and SUBSTITUTE with the following:

You shall not discriminate on the basis of race, gender, gender expression, gender identity, religion, national origin, ethnicity, sexual orientation, age, or disability in the solicitation, selection, hiring, or treatment of subcontractors, vendors, or suppliers.

END OF SUPPLEMENTARY SPECIAL PROVISIONS (SSP)

TECHNICAL SPECIFICATIONS

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DIVISION 41 MATERIAL PROCESSING AND HANDLING

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- 79. Section 41 22 33: Trolley Hoists

DIVISION 44 POLLUTION AND WASTE CONTROL

DIVISION 44 31 ODOR TREATMENT EQUIPMENT

- 80. Section 44 31 00: Carbon Adsorber Odor Control System

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**SECTION 01 01 00
SUMMARY OF WORK AND SEQUENCE OF CONSTRUCTION**

PART 1 - GENERAL

1.1 WORK COVERED BY CONTRACT DOCUMENTS

A. The Work of this contract is generally comprised of furnishing products, labor, tools, transportation, and services for the construction of improvements to the existing Sewage Pump Station 23T. This station was designed to have four pumps, but only Pumps #1 and #2 have been installed. Improvements are generally comprised of the following major work categories:

- Replacement of two existing 100 hp sewage pumps with two new 100 hp sewage pumps of same design capacity; with a third new 100 hp sewage pump furnished but not installed.
- Replacement of suction piping and certain discharge piping, within the pump room.
- Replacement of two access hatches inside the pump room.
- Removal of the MCC panels, pump control panels and other designated electrical equipment inside the pump room, and relocating them (or replacing them) at-grade within the pump station site.
- Replacement of a manual trolley and motorized hoist, with a new manual trolley and new manual hoist.
- Removal of designated equipment within the pump room.
- Removal of the pump room supply fan and exhaust fan, and installation of new fans of larger capacity, with modified locations for those two fans.
- Rehabilitation of certain mechanical components located within the wetwell:
 - Removal and replacement of the suction piping for Pumps #1 and #2.
 - Removal and replacement of the sluice gate and appurtenances. This sluice gate is located at the point of influent sewer discharge to the wetwell.
- Furnishing and installing a new MCC to be located above-grade near the lift station structure.
- Relocating the pump control panel to a location near the new above-grade MCC panels.
- Furnishing and installing a new telemetry panel above grade near the new MCC panels.
- Modifying and relocating the telemetry antenna.
- Constructing a new bypass pumping connection. This requires draining the forcemain from its highpoint, and modifying the existing yard piping.
- Furnishing and installing an odor control system to treat odorous air extracted from the wetwell.
- Implementing a pump station bypass using temporary pumps and furnishing appurtenances as needed to implement the bypass.
- Other work as indicated by the design drawings and project specifications.

B. Construction Phasing: The electrical design drawings define four phases for implementing electrical improvements. The four work phase are generally as described below:

- Phase I (See Dwg E-6): Provide power and control for a submersible sewage pump (maximum 100 hp) that will be the primary bypass pump. This pump will be installed in the influent manhole (see Dwg BP-1). This pump will be controlled by a temporary (and portable) VFD that is furnished by the bypass pumping contractor. Phase 1 also entails furnishing and installing an engine-driven self-priming pump as backup to the primary bypass pump. This pump will be located near the influent manhole (see Dwg BP-1). This pump will be controlled by temporary devices furnished and installed by the bypass pumping contractor. The Contractor is also required as part of Phase 1, to construct the bypass pumping connection (see General Notes on G-4 and Dwg BP-1). Once the bypass pumping system is in-place and has successfully passed its reliability testing period, the permanent pumps and controls can be taken out of service so that electrical construction can then proceed to Phase 2/Phase II.
 - Phase II (see Dwg E-7): Demolish all existing electrical equipment inside the Pump Room with the exception of the Telecom. Both bypass pumps shall remain in operating condition during this construction phase. The Telecom shall remain operational for remote monitoring of the bypass pumping system.
 - Phase III (see Dwg E-8): Install all new electrical equipment. During this phase, the Telecom cutover shall occur. The time period to remove the existing Telecom and installing new Telecom equipment above grade shall not exceed 8 hours. Contractor shall notify the City prior to removing the Telecom and installing the new Telecom equipment. This phase includes acceptance testing of the new electrical equipment, new pumps, new piping, and new controls, before proceeding to Phase 4.
 - Phase IV (see Dwg E-9): Remove the temporary electrical features (power, control, level sensing system, alarms, and temporary/portable VFD) associated with the bypass pumping system. Remove the primary and backup pumps. Complete any remaining improvements (civil, mechanical, electrical, etc.).
- C. Furnish and install complete operating engineered systems including appurtenant structural, mechanical and/or electrical mountings fittings or connections required for compliance with Manufacturer's installation requirements, for compliance with applicable building, fire, plumbing, mechanical, electrical, fuel gas, and energy codes and standards, and as needed to permit systems to perform all functions required by Contract Documents and described in Manufacturer's printed literature.

1.2 PROJECT LOCATION

- A. Project is located in City of San Diego, California, near Brown Field and just north of the Mexican/United States border.
- B. Project site conditions are as follows:

Ground Elevation: approximately 473 feet
 Typical Temperature Range: 31°F - 105°F

PART 2 – PRODUCTS

Not Applicable

PART 3 - EXECUTION

3.1 GENERAL WORK SEQUENCE

A. General Work Sequence:

1. Before beginning Work, coordinate with servicing electrical utility regarding electric service to site. Obtain required permits, licenses and construction easements. Call **Underground Service Alert** and utilities to obtain staking and marking of buried utilities. Submit proposed schedule of Work, insurance and bonds. Pothole as needed to supplement staking and marking. Take preconstruction photographs.
2. Verify utility locations, field dimensions, pipe types and voltage and phase of on-site electrical services. If discrepancies or conflicts are found, bring these to attention of Owner's Representative.
3. Submit shop drawings and other submittals.
4. Begin manufacturing and shipping materials and equipment after receiving approved submittals.
5. Mobilize for construction.
6. Setup and Implement Bypass Pumping
7. Empty and clean the wetwell.
8. Construct wetwell improvements per the contract documents.
9. Construct Pump Room improvements; this work includes mechanical, ventilation and associated electrical improvements, as well as SCADA system improvements).
10. Construct the Odor Control System.
11. Before removing the Bypass Pumping system, test the new pumps, piping modifications and electrical improvements to ensure they are functioning normally. Once the improvements have been successfully field tested, deactivate and remove the bypass pumping system.
12. Demonstrate satisfactory installation and operation of all installed work, including performing vendor and system functional test.
13. Provide operator training, including O&M manuals that contain engineering cut-sheets on all equipment.

14. Provide record drawings.
15. Clean up and restore construction areas and demobilize.
16. Provide warranty as specified.

3.2 NORMAL WORKING HOURS

- A. Normal working hours shall be as shown in Supplemental Special Provisions (SSP).
- B. Exceptions to this Work schedule shall be only as approved in writing by Owner.
- C. No work shall be done outside of normal work hours and work days, except such work as indicated on plans is necessary for proper care and protection of Work already performed, or except in case of emergency, and in any case only with written notice to Owner's Representative.
- D. Night work may be established as regular procedure by Contractor if they first obtain written acceptance from Owner. Such notice may be revoked at any time by Owner if Contractor fails to maintain adequate nighttime force and equipment for reasonable prosecution and to justify inspection of Work.

3.3 CITY HOLIDAYS AND SUMMER SEASON

- A. The City of San Diego observes the following holidays:

New Year's Day – January 1st
Martin Luther King Day – 3rd Monday in January
Presidents Day – 3rd Monday in February
Caesar Chavez Day – March 31st
Memorial Day – Last Monday in May
Independence Day – July 4
Labor Day – 1st Monday in September
Veteran's Day – November 11th
Thanksgiving Day – 4th Thursday in November
Christmas Day – December 25th

- B. Contractor is advised that City staff will not be available for contact during each of the above-listed holiday periods.

3.4 COOPERATION WITH OTHER CONTRACTORS

- A. Owner may have additional work performed in this area by other Contractors. Contract requires cooperation with those contractors in the area. Any difference or conflict which may arise between Contractor and other contractors shall be adjusted and determined by Owner. Contractor shall conduct their operations as to minimize interference with work being done by other contractors. Contractor shall, at their sole expense, make good, promptly, any injury or damage to other contractors' work caused at their hands.

3.5 CONTRACTOR USE OF PREMISES

A. The following requirements pertain to Contractor's use of the project site:

1. The Contractor's work for Sewage Pump Station 23T Improvements is limited to the area within the lift station's perimeter fencing plus the Material and Equipment Storage Area that is defined by Drawing G-5. Street parking is available along the south side of Siempre Viva Road (east of Cactus Road) subject to City parking and traffic regulations. Contractor shall not use areas outside the Work Area Limits without the Owner's written prior approval.
2. Contractor shall furnish and install temporary chain link fencing to fully enclose the indicated Material and Equipment Storage Area. This site security measure is intended to promote public safety, and to secure Contractor's work materials, tools and equipment. Chain link fencing shall be at least 6 feet high. Do not provide barbed wire on top.
3. Contractor may, at his option, furnish and install a 24-hour per day site surveillance system throughout the contract duration. All site security measures furnished, installed and monitored by the Contractor shall be at no additional cost to Owner.
4. The bypass pumping system will use above-ground HDPE piping to convey sewage flow from the primary or backup bypass pumping system to the existing forcemain (modified to have a point of connection for bypass pumping). The temporary piping, valving and appurtenances that will be above grade, as well as the bypass pumping systems shall be located within the lift station site.
5. If construction of indicated Sewage Pump Station 23T improvements requires shutdown of electrical power, or shutdown of potable water service. The Contractor shall coordinate with involved agencies/utility companies/entities such that the required outages/shutdowns do not cause loss of service to businesses/residents/City offices that are outside the designated work limits.
6. The Contractor shall protect existing improvements that are not indicated by the contract documents to be modified or demolished. Facilities or site features that are inadvertently damaged shall be restored to like-new condition by the Contractor, at no additional cost to the Owner.

B. Install approved signs, barricades and lights necessary to ensure public safety and safety of Owners operators and personnel. Provide steel plates across ditches to enable safe access of Owner's personnel to facilities.

C. Contractor shall restrict their area of operations to avoid damage of trees and shrubs and shall not remove trees unless specifically directed by Owner. Contractor shall legally dispose of all material removed. If burning is anticipated, Contractor shall obtain all necessary permits and shall give ample and proper notice to local fire warden.

- D. Fences, walls, shrubs, sprinkler systems, substructures or other improvements removed or disturbed by Contractor during construction shall promptly be replaced and/or repaired at Contractor's sole expense to satisfaction of Owner.

3.6 RESPONSIBILITY FOR JOB SITE CONDITIONS

- A. Contractor agrees they shall assume sole and complete responsibility for job site conditions during course of construction of Work, including safety of all persons and property; that this requirement shall apply continuously and not be limited to normal working hours; and that Contractor shall defend, indemnify and hold Owner and design consultant harmless from any and all liability except that arising from the sole negligence of Owner or design consultant.

**** END OF SECTION ****

**SECTION 01 02 50
MEASUREMENT AND PAYMENT**

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section defines the Lump Sum Prices, Unit Prices (Not Used), and Allowances listed in the Bid Schedule, and the manner in which they will be used to determine measurement and payment for all items included in the Bid Schedule. Parts 2 and 3 of this section describe the procedures required to be followed for monthly progress payments to the CONTRACTOR.
- B. Payment for all items of the Bid Schedule whether lump sum or unit price shall include all compensation to be received by the CONTRACTOR for furnishing all tools, equipment, supplies, and manufactured articles, and for all labor, operations, and incidentals appurtenant to the items of WORK being described, as necessary to complete the various items of the WORK all in accordance with the requirements of the Contract Documents, including all appurtenances thereto, and including all costs of permits and cost of compliance with the regulations of public agencies having jurisdiction, including Safety and Health Requirements of the California Division of Industrial Safety and the Occupational Safety and Health Administration of the U.S. Department of Labor (OSHA). No separate payment will be made for any item that is not specifically set forth in the Bid Schedule, and all costs shall be included in the prices named in the Bid Schedule for the various items of WORK.
- C. Final payment for WORK covered by Unit Prices will be made on the basis of the actual measured quantities accepted by the RESIDENT ENGINEER multiplied by the Unit Price of the Bid Schedule.

1.2 BID PROPOSAL

- A. Lump Sum Prices: The CONTRACTOR shall provide Lump Sum Prices in the Bid Schedule for all WORK in the Contract Documents, except items of WORK listed in the Contract as Unit Priced Items. For Lump Sum items, only the total amount need be filled in.
- B. Unit Price Items: Not Used.
- C. Allowance Items: Allowance Item amounts are provided by the OWNER to cover the cost of additive WORK not presently identified in the Contract Documents. Payment for Allowance Items will be made only when authorized as described in Part 1.3, below.
- D. Schedule Adjustment due to Scoped Allowance Bid Items: Not Used.
- E. The OWNER reserves the right to vary the total contract price by 25% by varying the authorized Allowance amount beyond the amount stated in the contract documents.
- F. Stipulated or Bid Unit Prices – Not Used.
- G. Quantities for each item in the Bid Schedule: Not Used.

- H. Specified Items and Stipulated Prices: The stipulated price for these items cannot be invoiced until the item is complete and accepted by the RESIDENT ENGINEER and the OWNER.

1.3 MEASUREMENT AND PAYMENT

A. General: This article defines the manner and method to develop the Lump Sum, and Allowance bid amounts of all items identified in the Bid Schedule. Bid amounts will include all plant, equipment, tools materials, labor, service, and all other items required to complete the WORK included in the Contract unless specifically excluded by this section. WORK required for which no separate bid item is identified will be considered as a subsidiary obligation of the CONTRACTOR, and the cost therefore shall be included in the most applicable bid item. Compensation for completion of the WORK will be determined by use of the cost loaded CPM schedule. Bid amounts for each item will be the basis for development of budget values for activities included in the cost loaded CPM schedule. Unit Price and Allowance Bid Item amounts will also be adjusted by a Change Order to the contract amount when WORK is completed, and actual authorized quantities and Allowance amounts are established. The allowable variation in quantities is identified in each Unit Price Bid Item.

B. Contract-Required WORK (Lump Sum):

1. **Bid Item No. 01 –General Construction (Lump Sum)**:

Payment for general construction will be made at the lump sum price named in the Bid Schedule under Item No. 01, which price shall constitute full compensation for completion of all mobilization, demobilization, insurance, and permits, supervision, planning, design, engineering fees associated with construction activities for CONTRACTOR-required design efforts, furnishing and constructing all improvements to SPS 23T, complete as defined within these Contract Documents including dewatering, with the sole exclusion of the payments to be made as defined herein for the other items required by the Contract Documents and listed elsewhere in the Contract-Required Lump-Sum category or Contract-Required Unit Price category in the Bid Schedule.

2. **Bid Item No. 2 – Sheeting, Shoring and Bracing (Lump Sum)**:

Payment for all temporary sheeting, shoring and bracing will be made at the lump sum price named in the Bid Schedule under Item No. 02, with the sole exclusion of the payments to be made as defined herein for the other items required by the Contract Documents and listed elsewhere in the Contract-Required Lump-Sum category or Contract-Required Unit Price category in the Bid Schedule.

The price shall constitute full compensation for all temporary sheeting, shoring and bracing required by the Contract Documents and/or site conditions. Sheeting, shoring and bracing shall include all planning, design, engineering fees (including designer inspection and certification of installation), furnishing and constructing, removal and proper disposal of such temporary sheeting, shoring and bracing, complete, as required under the provisions of any permits and in accordance with the requirements of CALOSHA and the Construction Safety Orders of the State of California, pursuant to the provisions of Section 6707 of the California Labor Code.

3. **Bid Item No. 3 – Final Approval of Operation & Maintenance Manuals (or Owner's Manuals) and Master Record Documents (Stipulated Lump Sum):**

Payment for the contract-required Operation and Maintenance Manuals (or Owner's Manuals) and Master Record Documents (TO INCLUDE DRAWINGS AND SPECIFICATIONS) will be made at the lump sum price named in the Bid Schedule under Item No. 3, with the sole exclusion of the payments to be made as defined herein for the other items required by the Contract Documents and listed elsewhere in the Contract-Required Lump-Sum category or Contract-Required Unit Price category in the Bid Schedule. The price shall constitute full compensation for preparation, submittal, required revisions, complete administration and full execution and the OWNER's full acceptance of the Operations and Maintenance manuals (or Owner's Manuals) and the Master Record Documents (to include drawings and specifications) and FINAL acceptance of ALL of them by the OWNER and complete as defined within these Contract Documents.

The stipulated lump sum price must be included in the bid at the stipulated amount, and CANNOT be invoiced until the specified item is complete as defined within these Contract Documents, submitted, and FULLY ACCEPTED by the OWNER. This specified item is a requirement of the contract.

4. **Bid Item No. 4 – Water Pollution Control Plan (WPCP) Program Development (Lump Sum):**

Payment for the contract-required Water Pollution Control Plan (WPCP) Program Development will be made at the lump sum price named in the Bid Schedule under Item No. 4 with the sole exclusion of the payments to be made as defined herein for the other items required by the Contract Documents and listed elsewhere in the Lump-Sum category or Contract-Required Unit Price category in the Bid Schedule. The price shall constitute full compensation for preparation, submittal, revisions, and complete administration and full development of the WPCP and FINAL acceptance by the OWNER and complete as defined within these Contract Documents.

5. **Bid Item No. 5 – Water Pollution Control Plan (WPCP) Program Implementation (Lump Sum):**

Payment for the contract-required Water Pollution Control Plan (WPCP) Program Implementation will be made at the lump sum price named in the Bid Schedule under Item No. 5 with the sole exclusion of the payments to be made as defined herein for the other items required by the Contract Documents and listed elsewhere in the Lump-Sum category or Contract-Required Unit Price category in the Bid Schedule. The price shall constitute full compensation for complete administration, full execution, implementation and maintenance of the OWNER-accepted WPCP and FINAL acceptance by the OWNER and complete as defined within these contract documents.

6. **Bid Item No. 6 – Bonds (Lump Sum):**

Payment for all contract-required Bonds will be made at the lump sum price named in the Bid Schedule under Item No. 6 and complete as defined within

these Contract Documents with the sole exclusion of the payments to be made as defined herein for the other items required by the Contract Documents and listed elsewhere in the Lump-Sum category or Contract-Required Unit Price category in the Bid Schedule.

C. Allowance Bid Items for WORK not included in the original Contract Documents (including Addenda), but ultimately included in the Contractual Final Scope of Work

1. Bid Item No. 7 – Field Orders (Allowance):

No measurement will be made for this item. Payment for WORK under bid item No. 7 will be made only to the extent that such WORK is specifically authorized in advance by the OWNER.

Determining the price for miscellaneous field orders will be done in accordance with the contract provisions.

Prices for this WORK will be negotiated. An allowance for overhead and profit will be permitted in accordance with the provisions of this contract. This item is considered incidental to the Contract and may be adjusted, or deleted in its entirety, as determined by the OWNER.

2. Bid Item No. 8 – Treatment and Disposal of Contaminated Ground Water and Contaminated Soil (Allowance):

Payment for WORK under bid item No. 8 will be made only to the extent that such WORK is specifically authorized in advance by the OWNER.

Determining the price for treatment and disposal of contaminated ground water and contaminated soil will be done in accordance with the contract provisions.

Prices for this WORK will be negotiated. An allowance for overhead and profit will be permitted in accordance with the provisions of this contract. This item is considered incidental to the Contract and may be adjusted, or deleted in its entirety, as determined by the OWNER.

3. Bid Item No. 9 – Dewatering Effluent Discharge Fee (Allowance):

Payment for WORK under bid item No. 9 will be made only to the extent that such WORK is specifically authorized in advance by the OWNER.

Prices for this WORK shall cover all costs for fees and related expenses for obtaining permits. This item is considered incidental to the Contract and may be adjusted, or deleted in its entirety, as determined by the OWNER.

PART 2 - PRODUCTS

2.1 GENERAL PROGRESS PAYMENT REQUIREMENTS

- A. Payment for WORK performed shall be in accordance with the Cost-Loaded CPM. The RESIDENT ENGINEER will verify measurements and quantities. Each activity

necessary to manage and complete the WORK is identified on the contract schedules. Each activity will be assigned its respective value, a portion of the contract price, as shown on the Summary of Values.

- B. Payment for all lump sum costs and services incurred on this Contract shall be based on the earned value of WORK accomplished during the reporting period. Earned value is determined by the completion percentage of each activity applied to the total value of the activity. No construction activity shall be deemed 100% complete until the CONTRACTOR has completed the physical check out and inspection of the completed WORK and has submitted the signed inspection form to the RESIDENT ENGINEER.
- C. Unit price items: Not Used.
- D. Earned value is derived from the current status of the CONTRACTOR Construction Schedule as determined by the monthly schedule status submittals. Each schedule status submittal is reviewed and approved by the RESIDENT ENGINEER prior to the CONTRACTOR obtaining approval for the Summary of Earned Values or quantities installed and the Application for Payment.
- E. The CONTRACTOR shall not take advantage of any apparent error or omission on the Drawings or Specifications, and the RESIDENT ENGINEER shall be permitted to make corrections and interpretations as may be deemed necessary for fulfillment of the intent of the Contract Documents at no additional cost to the OWNER.
- F. The retainage specified in the contract shall apply to all payments to the CONTRACTOR including permits and mobilization.

2.2 APPLICATION FOR PAYMENT

- A. Application for payment shall be on the OWNER's form provided by the RESIDENT ENGINEER and certified by signature of an Authorized Officer of the CONTRACTOR. Three (3) copies of the application for payment shall be submitted. Application shall be made monthly.
- B. The Application for Payment contains all necessary references and attachments that substantiate the invoice for progress payment, (e.g., certified payrolls, labor reports, progress schedule data, and Summary of Earned Values). It must be preceded or accompanied by schedule and status data.
- C. The Application for Payment is submitted according to the format and instructions provided by the OWNER and covering the WORK completed through the last day of the previous month or through the date established by the RESIDENT ENGINEER.

PART 3 - EXECUTION

3.1 MONTHLY REVIEWS/APPLICATION FOR PAYMENT

- A. Monthly review meetings between the CONTRACTOR and the RESIDENT ENGINEER will be held within seven (7) calendar days prior to the payment application date designated by the RESIDENT ENGINEER. Prior to the monthly review meeting, the CONTRACTOR will submit the Master Record Documents as identified in Section 01 05 00 1.3.A.2, an updated schedule and a signed application for payment showing

a Summary of Earned Values for the reporting and payment period so that the RESIDENT ENGINEER can compare earned values to available status data. The CONTRACTOR shall make any adjustments to the Master Record Documents, updated schedule, and payment applications deemed necessary. Upon completion of the adjustments the RESIDENT ENGINEER will sign the payment request and forward it to the OWNER. The RESIDENT ENGINEER will determine payment amounts if agreement with the CONTRACTOR is not reached.

**** END OF SECTION ****

**SECTION 01 03 90
COORDINATION AND MEETINGS**

PART 1 - GENERAL

1.1 GENERAL

- A. In addition to coordination requirements, this section includes information on the pre-construction meeting, the site mobilization meeting, progress meetings, pre-installation meetings, means and methods meetings, and risk management meetings, if required.

1.2 COORDINATION

- A. Coordinate scheduling, submittals, and work of the various sections of the Specifications to assure an efficient and orderly sequence of installation of interdependent construction elements.
- B. Verify utility requirements and characteristics of operating equipment are compatible with building utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.
- C. Coordinate space requirements and installation of mechanical and electrical work which are indicated diagrammatically on drawings. Follow routing shown for pipes, ducts, and conduit, as closely as practicable; place runs parallel with line of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.
- D. Coordinate completion and clean-up of work of separate sections in preparation for Substantial Completion and for portions of work designated for OWNER'S partial utilization.
- E. After OWNER occupancy of premises, coordinate access to site for correction of defective work and work not in accordance with Contract Documents, to minimize disruption of OWNER'S activities.
- F. Coordinate with other contractors working onsite to avoid impacting their operations, and to insure that facility interfaces are properly joined.

1.3 PRE-CONSTRUCTION MEETING

- A. Prior to the commencement of work at the site, a preconstruction conference will be held at a mutually agreed time and place. The CONTRACTOR's Project Manager, its superintendent, and subcontractors as the CONTRACTOR deems appropriate shall attend the preconstruction conference. Other attendees will be:
 - 1. RESIDENT ENGINEER
 - 2. Representatives of the OWNER.
 - 3. Others, as requested by the CONTRACTOR, OWNER, or RESIDENT ENGINEER.

- B. Unless previously submitted to the RESIDENT ENGINEER, the CONTRACTOR shall bring to the conference information requested with the notification of the time and place of the preconstruction conference.
- C. The purpose of the conference is to designate responsible personnel and establish a working relationship. Matters requiring coordination will be discussed and procedures for handling such matters established. The complete agenda will be furnished to the CONTRACTOR prior to the meeting date. However, the CONTRACTOR should be prepared to discuss all of the items listed below.
 - 1. Status of CONTRACTOR's insurance and bonds.
 - 2. CONTRACTOR's tentative schedules.
 - 3. Transmittal, review, and distribution of CONTRACTOR's submittals.
 - 4. Processing applications for payment.
 - 5. Maintaining Record Documents.
 - 6. Critical work sequencing.
 - 7. Field decisions and Change Orders.
 - 8. Use of project site, office and storage areas, security, housekeeping, and OWNER's needs.
 - 9. Major equipment deliveries and priorities.
 - 10. CONTRACTOR's assignments for safety and first aid.
- D. The RESIDENT ENGINEER will preside at the preconstruction conference and will arrange for recording and distributing the minutes in written form to all persons in attendance.

1.4 SITE MOBILIZATION MEETINGS

- A. The RESIDENT ENGINEER will schedule a meeting at the Project sites prior to CONTRACTOR occupancy.
- B. Attendance Required: OWNER, RESIDENT ENGINEER, CONTRACTOR, Superintendent, and major Subcontractors/Vendors.
- C. Agenda:
 - 1. Use of premises by OWNER and CONTRACTOR.
 - 2. OWNER'S requirements and partial occupancy if applicable.
 - 3. Construction facilities and controls provided by OWNER.
 - 4. Temporary utilities provided by OWNER.
 - 5. Survey and building layout.
 - 6. Security and housekeeping procedures.
 - 7. Schedules.
 - 8. Procedures for testing.
 - 9. Procedures for maintaining record documents.
 - 10. Requirements for start-up of equipment.
 - 11. Inspection and acceptance of equipment put into service during construction period.

D. The RESIDENT ENGINEER will record minutes and distribute copies to all participants.

1.5 CONSTRUCTION PROGRESS MEETINGS

- A. The RESIDENT ENGINEER shall schedule and hold regular progress meetings:
- Weekly at the beginning of construction or during the peak of construction activities.
 - Bi-weekly during remaining construction phases.
 - Or at other times as required by progress of the WORK.

The CONTRACTOR shall attend, and may also bring representatives of its suppliers, manufacturers, and subcontractors.

- B. The RESIDENT ENGINEER shall preside at the meetings and will arrange for keeping and distributing the minutes. The purpose of the meetings will be to review the progress of the WORK, maintain coordination of efforts, discuss changes in scheduling, and resolve other problems which may develop. During each meeting, the CONTRACTOR is required to present any issues which may impact his work, with a view to resolve these issues expeditiously.

1.6 PRE-INSTALLATION MEETING

- A. When required in individual specification sections, The RESIDENT ENGINEER will convene a pre-installation meeting at the work site prior to commencing work of the section.
- B. Attendance will be required of parties directly affecting, or affected by, work of the specific section. Failure of the CONTRACTOR, subcontractor, or Supplier to attend may result in a charge to the CONTRACTOR for costs incurred by the OWNER, RESIDENT ENGINEER, and/or DESIGN CONSULTANT in attending the meeting.
- C. The RESIDENT ENGINEER will prepare an agenda and preside at the meeting:
1. Review conditions of installation, preparation and installation procedures.
 2. Review coordination with related work.
- D. The RESIDENT ENGINEER will record the minutes and distribute copies to the OWNER, CONTRACTOR, and other participants.

1.7 CONSTRUCTION SCHEDULE AND COMMENCEMENT OF THE WORK

- A. CONTRACTOR shall comply with construction schedule requirements of the 2015 Greenbook and the 2015 Whitebook (Section 6 of these documents pertain to this topic).

1.8. RISK MANAGEMENT MEETINGS.

- A. The CONTRACTOR shall participate in Risk Management and Analyses meetings, as requested by the RESIDENT ENGINEER or the OWNER.

PART 2 - PRODUCTS NOT USED

PART 3 - EXECUTION NOT USED

**** END OF SECTION ****

**SECTION 01 04 00
ADDITIONAL COORDINATION REQUIREMENTS**

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Licenses, permits, sales taxes, coordination with Owner, Federal, State and Local authorities, utilities, neighboring property owners, special events, design engineer, and other contractors.

1.2 RELATED WORK

- A. Section 01 03 90: Coordination and Meetings
B. Section 01 51 00: Temporary Utilities
C. Section 01 53 00: Protection of Existing Facilities

1.3 PERMITS

- A. Obtain, pay for, and comply with required permits, licenses, work permits and authorizations from appropriate agencies, including:

1. Licenses:

- a) Before submitting bids, Contractors shall be licensed in accordance with provisions of Chapter 9, Division 3, of Business and Professions Code of State of California.

2. State and Federal permits:

- a) Owner will obtain and have on hand for Contractor the following permits prior to commencement of construction:

- NPDES Discharge Permit (if required for construction)

- b) Contractor shall obtain the following permits:

- Excavation and Dirt Moving Permit from Cal OSHA
- Safety Permit from California Division of Industrial Safety

3. Local permits:

If required for the WORK of this contract, Contractor shall execute Special Inspection Agreement with City's Building Inspection Department, prior to commencing construction.

Contractor shall obtain (as required for construction):

- a) Building Permit (if required) from City of San Diego, Building Inspection Department.
- b) Grading Permit (if required) from City of San Diego, Building Inspection Department.
- c) Encroachment Permit (if required) from City of San Diego.

B. Obtain permits before starting construction.

1.4 COORDINATION WITH CITY OF SAN DIEGO

- A. Notify City in writing at least 72 hours before any shutdown of sewage facilities. Sewage facilities cannot be shut down without prior written authorization.
- B. Coordinate with City Staff regarding the operation of existing pumps, valves or other facilities that are critical to operation of this facility.

1.5 REQUESTS FOR INFORMATION (RFI'S)

- A. Immediately upon discovery of need for additional information or interpretation of Contract Documents, Contractor shall prepare and submit an RFI in format specified. Owner's Representative will only respond to RFI's submitted by Contractor. RFI's submitted by other entities will be returned with no response.
- B. Coordinate and submit RFIs in prompt manner to avoid delays in Contractor's Work or Work of subcontractors.
- C. RFI's shall include detailed, legible description of item needing information or interpretation and the following:
 - 1. Project name.
 - 2. Project number.
 - 3. Date.
 - 4. Name of Contractor.
 - 5. Name of Engineer of Record
 - 6. Name of Owner's Representative.
 - 7. RFI number, numbered sequentially.
 - 8. RFI subject.
 - 9. Specification Section number and title and related paragraphs, as appropriate.
 - 10. Drawing number and detail references, as appropriate.

11. Field dimensions and conditions, as appropriate.
 12. Contractor's suggested resolution. If Contractor's suggested resolution impacts Contract Time or Contract Sum, Contractor shall state impact in RFI.
 13. Contractor's signature.
 14. Attachments, including sketches, descriptions, measurements, photos, catalog data, shop drawings, coordination drawings, and other information necessary to fully describe items needing interpretation. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.
- D. RFI Forms shall be software-generated forms with content shown above, acceptable to Owner's Representative.
- E. Attachments shall be electronic files in Adobe Acrobat PDF format.
- F. Owner's Representative will review each RFI, determine action required, and respond. Allow 7 working days for Owner's response for each RFI. RFIs received by Owner's Representative after 1:00 p.m. will be considered as received the following working day.
- G. The following Contractor-generated RFIs will be returned without action:
1. Requests for acceptance of submittals.
 2. Requests for acceptance of substitutions where no monetary rebate is included.
 3. Requests for acceptance of Contractor's means and methods.
 4. Requests for coordination information already indicated in Contract Documents.
 5. Requests for adjustments in Contract Time or Contract Sum.
 6. Requests for interpretation of actions of Owner's Representative on submittals.
 7. Incomplete RFIs or inaccurately prepared RFIs.
- H. Owner's Representative's action may include request for additional information, in which case Owner's Representative's time for response will date from time of receipt of additional information.
- I. Owner's Representative's action on RFIs that may result in changes to Contract Time or Contract Sum may be eligible for Contractor to submit Change Order requests.
- J. If Contractor believes RFI response warrants change in Contract Time or Contract Sum, notify Owner's Representative in writing within 10 days of receipt of RFI response.

- K. Prepare, maintain, and submit tabular log of RFIs organized by RFI number. Submit log weekly. Include the following:
1. Project name.
 2. Name and address of Contractor.
 3. Name and address of Owner's Representative.
 4. RFI number including RFIs returned without action or withdrawn.
 5. RFI description.
 6. Date RFI was submitted.
 7. Date Owner's Representative's response was received.
- L. On receipt of Owner's Representative's action, update RFI log and immediately distribute RFI response to affected parties. Review response and notify Owner's Representative within 7 days if Contractor disagrees with response.

1.6 COORDINATION WITH CITY OF SAN DIEGO

- A. Contact City of San Diego 72 hours before start of construction at the following location:

CITY OF SAN DIEGO
Public Works Department
525 "B" Street, Suite 750
San Diego, CA 92101

(619) 533-5196 (direct to Ivan)

Ivan Hoffman, Associate Engineer-Electrical

- B. Do not begin Work until Contractor's schedule, traffic control plans, haul routes, and permits have been reviewed and approved by City.
- C. Do not shut down utilities without prior written authorization.
- D. Coordinate with the City regarding preparation for, and implementation of, bypass pumping.

1.7 COORDINATION WITH COUNTY OR CITY TRAFFIC ENGINEER

- A. Coordinate with County or City Traffic Engineer as required, to perform all portions of Work.

1.8 COORDINATION WITH PROPERTY OWNERS AND BUSINESSES

- A. Coordinate construction with property owners or businesses neighboring project limits.

1.9 COORDINATION WITH UTILITIES

- A. Obtain service requirements from public utilities for water, sewer, gas, power, telephone, telemetering and other utility requirements. Work needed to connect to public utilities shall comply with utility service requirements. Pay service charges of utilities, including charges for trenching, piping, conduit, cables, boxes, metering, grounding and backfill.
- B. Protect existing underground utilities.
- C. Electrical utility companies may maintain energized aerial electrical power lines in immediate vicinity of Work. Do not consider these lines to be insulated. Construction personnel working near these lines are exposed to an extreme hazard from electrical shock. Contractors, their employees, and construction personnel working on this project must be warned of the danger and instructed to take adequate protective measures, including maintaining at least 10 feet clearance between lines and construction equipment and personnel. (See OSHA Std. 1926.550(A)15). As an additional safety precaution, call electrical utility company to arrange, if possible, to have these lines de-energized or relocated when Work reaches their immediate vicinity. Cost of such temporary arrangements shall be borne by Contractor.

1.10 COORDINATION WITH DESIGN ENGINEER

- A. Engineering firm responsible for preparation of Plans and Specifications is:

PSOMAS
401 "B" Street, Suite 1600
San Diego, CA 92101
(619) 961-2800

Contact: Michael Pollard, PE

1.11 LINES OF COMMUNICATION

- A. Lines of communication between Contractor, Owner, and other parties shall be defined at Preconstruction Conference. Contractor shall adhere to direction regarding this matter given to them at that time.

1.12 SUBMITTALS

- A. Supplementary progress schedules shall be submitted after Work is in progress, when requested by Owner's Representative. Schedule changes requiring increase in Owner's, Servicing Utility's or City's Engineering personnel on project shall not be put into effect until Owner, Servicing Utility, or City has made arrangements for additional personnel.

1.13 UNIT PRICES

- A. Payment for obtaining and complying with permits during construction, including NPDES permits, building permits, encroachment permits, excavation permits, drilling permits, disposal permits, temporary easements, licenses, inspection fees, and Federal, State and local taxes will be included in prices bid for Work for which such costs are appurtenant.
- B. Payment for coordinating with agencies, events and persons described will be included in prices bid for Work to which coordination is appurtenant.

PART 2 - PRODUCTS

Not Applicable

PART 3 – EXECUTION

Not Applicable

**** END OF SECTION ****

**SECTION 01 04 50
CUTTING AND PATCHING**

PART 1 - GENERAL

1.1 DEFINITION

- A. "Cutting-and-Patching" is defined to include the cutting and patching of nominally completed and previously existing concrete, steel, wood, and miscellaneous metal structures; piping; and pavement in order to accommodate the coordination of the WORK, or the installation of other facilities or structures or to uncover other facilities and structures for access or inspection, or to obtain samples for testing, or for similar purposes.

1.2 REQUIREMENTS OF STRUCTURAL WORK

- A. Structural work shall not be cut or patched in a manner that may result in a reduction of load-carrying capacity or load/deflection ratio.
- B. Prior to cutting-and-patching the following categories of work, the CONTRACTOR shall obtain the RESIDENT ENGINEER'S approval to proceed:
1. Structural steel
 2. Miscellaneous structural metals, including equipment supports, stair systems and similar categories of work
 3. Structural concrete
 4. Foundation construction
 5. Timber and primary wood framing
 6. Bearing and retaining walls
 7. Structural decking
 8. Exterior curtain wall construction
 9. Pressurized piping, vessels and equipment

1.3 OPERATIONAL AND SAFETY LIMITATIONS

- A. The CONTRACTOR shall not cut or patch operational elements and safety-related components in a manner that may result in a reduction of capacities to perform in the manner intended or result in decreased operational life, increased maintenance, or decreased safety.
- B. Prior to cutting-and-patching the following categories of work, the CONTRACTOR shall obtain the RESIDENT ENGINEER'S approval to proceed:
1. Sheeting, shoring and cross bracing
 2. Operating systems and equipment

3. Water, moisture, vapor, air, smoke barriers, membranes and flashings
4. Noise and vibration control elements and systems
5. Control, communication, conveying and a electrical wiring systems
6. Fire protection systems

1.4 VISUAL REQUIREMENTS

- A. The CONTRACTOR shall not cut or patch work which is exposed on the exterior or exposed in occupied spaces, in a manner that may result in a reduction of visual qualities or resulting in substantial evidence of the cut-and-patch work, both as judged solely by the RESIDENT ENGINEER. The CONTRACTOR shall remove and replace work judged by the RESIDENT ENGINEER to have been cut or patched in a visually unsatisfactory manner.

1.5 APPROVALS

- A. Where prior approval of cutting-and-patching is required, the CONTRACTOR shall submit the request well in advance of time work will be performed. The request should include a description of why cutting-and-patching cannot reasonably be avoided, how it will be performed, how structural elements (if any) will be reinforced, products to be used, firms and tradesmen to perform the work, approximate dates of the work, and anticipated results in terms of structural, operational, and visual variations from the original WORK.
- B. List utilities that will be disturbed or affected, including those that will be relocated and those that will be temporarily out-of-service. Indicate how long service will be disrupted.
- C. Where cutting-and-patching involves addition of reinforcement to structural elements, submit details and engineering calculations to show how reinforcement is integrated with the original structure.
- D. Approval by the RESIDENT ENGINEER to proceed with the cutting-and-patching does not waive the RESIDENT ENGINEER'S right to later require complete removal and replacement of a part of the WORK found to be not in accordance with the Contract Documents or industry standards.

PART 2 - PRODUCTS

2.1 MATERIALS USED IN CUTTING-AND-PATCHING

- A. Unless noted otherwise, the CONTRACTOR shall use material identical with the original materials where feasible. If identical materials are not available, the CONTRACTOR shall provide materials for cutting-and-patching which will result in equal-or-better work than the work being cut-and-patched, in terms of performance characteristics and visual effects where applicable.
- B. Materials shall comply with the requirements of the technical specifications wherever applicable.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Before cutting existing surfaces, the CONTRACTOR shall examine surfaces to be cut and patched and conditions under which cutting and patching is to be performed. The CONTRACTOR shall take corrective action before proceeding, if unsafe or unsatisfactory conditions, as determined by the RESIDENT ENGINEER, are encountered.
- B. Before proceeding, the CONTRACTOR shall meet at the site with all subcontractors involved in cutting and patching, the RESIDENT ENGINEER, and any contractors or subcontractors. Areas of potential interference and conflict shall be reviewed and procedures to resolve potential conflicts shall be determined.

3.2 PREPARATION

- A. Provide temporary support of work to be cut.
- B. Protect existing work during cutting-and-patching to prevent damage. Provide protection from adverse weather conditions for portions of the project that might be exposed during cutting-and-patching operations.
- C. Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.
- D. Take all precautions necessary to avoid cutting existing pipe, conduit or ductwork that must remain in service. Do not remove or relocate until provisions have been made to bypass them.
- E. Take precaution necessary to prevent fires and to prevent the false activation of fire alarms.

3.3 PERFORMANCE

- A. Employ skilled workmen to perform cutting-and-patching. Proceed with cutting-and-patching at the earliest feasible time and complete without delay.
- B. Cut existing work to provide for installation of other components or performance of other construction activities and the subsequent fitting and patching required to restore surfaces to their original condition.
- C. Cut existing work using methods least likely to damage elements to be retained or adjoining construction. Where possible, review proposed procedures with the original installer; comply with the original installer's recommendations. Review as-built or record drawings if available.
- D. In general, where cutting is required, use hand or small power tools designed for sawing or grinding, not hammering and chopping. Cut holes and slots neatly to size required with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
- E. To avoid marring existing finished surfaces, cut or drill from the exposed or finished side into concealed surfaces.

- F. Cut through concrete and masonry using a cutting machine such as a carborundum saw or diamond core drill.
- G. Comply with requirements of applicable Sections of Division 02 where cutting and patching requires excavating and backfilling.
- H. Bypass utility services such as pipe or conduit, before cutting, where services are shown or required to be removed, relocated or abandoned. Cut off pipe or conduit in walls or partitions to be removed. Cap, valve or plug and seal the remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after bypassing and cutting.
- I. Patch with durable seams that are as invisible as possible. Comply with tolerances as specified in these Contract Documents.
- J. Where feasible, inspect and test patch areas to demonstrate integrity of the installation.
- K. Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in manner that will minimize evidence of patching and refinishing.
- L. Where removal of walls or partitions extends from one finished area into another, patch and repair floor and wall surfaces in the new space to provide an even surface of uniform color and appearance. Remove existing floor and wall coverings and replace with new materials, if necessary to achieve uniform color and appearance.
- M. At penetration of fire rated walls, ceilings, or floors, completely seal voids with suitable fire rated material to full thickness of the penetrated element.

3.4 CLEANING

- A. Thoroughly clean areas and spaces where cutting-and-patching is performed or used as access. Remove completely paint, mortar, oils, putty and items of similar nature. Thoroughly clean piping, conduit and similar features before painting or other finishing is applied. Restore damaged pipe covering to its original condition.

**** END OF SECTION ****

**SECTION 01 05 00
FIELD ENGINEERING**

PART 1 - GENERAL

1.1 QUALITY CONTROL

A. The CONTRACTOR is required to do the following:

1. To perform land surveying services, employ a land surveyor registered in the State of California and acceptable to the OWNER. Use qualified personnel to assist surveyor.
2. Submit evidence of Surveyor's Errors and Omissions insurance coverage in the form of an insurance certificate.
3. Employ a professional engineer of the discipline required for specific service on the project, registered (current) in the State of California.

1.2 PROJECT MASTER RECORD DOCUMENTS

A. The CONTRACTOR is required to:

1. Maintain a complete and accurate log of control and survey work as it progresses.
2. The CONTRACTOR shall keep and maintain, at the job site, one record set of CONTRACT SPECIFICATIONS AND DRAWINGS. Please note that in the previous sentence, SPECIFICATIONS were called out in addition to the DRAWINGS. The CONTRACTOR shall mark all project conditions, locations, configurations, and any other changes or deviations which may vary from the details represented on the original Contract Documents, including buried or concealed construction and utility features which are revealed during the course of construction. Special attention shall be given to recording the horizontal and vertical location of all buried utilities that differ from the locations indicated, or which were not indicated on the Contract Documents. Record Documents shall be supplemented by any detailed sketches or photographs as necessary or directed to indicate, fully, the WORK as actually constructed. These Master Record Documents of the CONTRACTOR's representation of as-built conditions, including all revisions made necessary by Requests for Information, Addenda, Field Orders, approved Submittals, properly verified test reports, and Change Orders shall be maintained up-to-date during the progress of the WORK, and shall be made available for review and comment by the RESIDENT ENGINEER at the monthly review meeting (reference 01025, 3.1.A).
3. On the RECORD SPECIFICATIONS, legibly mark and record at each Product Section a description of the actual Products installed, including the following:
 - Manufacturer's name, address and telephone number and product model and serial number.
 - Product substitutions or alternates utilized.

- Changes made by Addenda, Requests for Information, Clarifications, Field Orders, or Change Orders.
4. Legibly mark RECORD DRAWINGS AND SHOP DRAWINGS to record actual construction including:
 - Measured depths of foundations in relation to finish floor datum.
 - Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
 - Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the WORK.
 - Field changes of dimension and detail.
 - Details not on original or incorrectly depicted on Contract Drawings.
 5. In the case of those drawings which depict the detail requirement for equipment to be assembled and wired in the factory, such as motor control centers and the like, the Record Documents shall be updated by indicating those portions which are superseded by change order drawings or final shop drawings, and by including appropriate reference information describing the change orders by number and the shop drawings by manufacturer, drawing, and revision numbers.
 6. Make Record Documents (INCLUDING BOTH DRAWINGS AND SPECIFICATIONS) accessible to the RESIDENT ENGINEER at all times during the construction period.
- B. The RESIDENT ENGINEER shall review the CONTRACTOR'S updated Record Documents on a monthly basis as a prerequisite for recommending approval of the CONTRACTOR'S monthly progress payment. Failure of the CONTRACTOR to maintain updated Record Documents shall result in delaying the CONTRACTOR'S monthly progress payment until such Record Documents are properly updated.
 - C. Upon substantial completion of the WORK and prior to final acceptance, the CONTRACTOR shall finalize and deliver a complete set of Master Record Documents (INCLUDING BOTH DRAWINGS AND SPECIFICATIONS) to the RESIDENT ENGINEER for transmittal to the OWNER, conforming to the construction records of the CONTRACTOR. This set of Master Record Documents shall consist of corrected specifications showing any revisions and corrected full sized drawings showing the reported location of the WORK. Said up-to-date Master Record Documents shall be in the form of a set of full sized prints and specifications with legibly plotted information overlaid in red. The information submitted by the CONTRACTOR in the Master Record Documents will be assumed to be correct, and the CONTRACTOR shall be responsible for the accuracy of such information, and for any errors or omissions which may appear on the Master Record Documents as a result.
 - D. Final payment or Release of Retention will not be acted upon until the CONTRACTOR-prepared Master Record Documents have been delivered to the RESIDENT ENGINEER AND FULLY APPROVED BY THE OWNER.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify locations of survey control points prior to starting work.
- B. Verify horizontal and vertical position of reference points by field traverse to at least two other reference points prior to each use of reference point.
- C. Promptly notify the RESIDENT ENGINEER of any discrepancies discovered prior to proceeding with the work.

3.2 SURVEY REQUIREMENTS

- A. Contractor shall comply with Greenbook and Whitebook requirements.

3.3 REQUESTS FOR AUTHORIZATION TO PROCEED WITH EXCAVATION

- A. All excavation for earthwork, underground utility installation, foundation construction or temporary facilities, shall not begin until the CONTRACTOR has received authorization to proceed with the excavation from the RESIDENT ENGINEER.
- B. The purpose of the excavation authorization procedure is as follows:
 - 1. Notifies the Safety Manager of the need for monitoring the excavation and to assure that all safety plans and/or trench shoring plans have been reviewed.
 - 2. Advises the Safety Manager of the name of the Competent Person in charge of the excavation.
 - 3. Allows the RESIDENT ENGINEER to notify the CONTRACTOR of special conditions or procedures required during the excavation.
 - 4. Notifies the RESIDENT ENGINEER of any work that must be coordinated by the CONTRACTOR with other contractors/agencies on-site or adjacent to the work site.
- C. The CONTRACTOR shall notify the RESIDENT ENGINEER of intention to excavate by transmitting "REQUEST FOR AUTHORIZATION TO PROCEED WITH EXCAVATION", Exhibit 1, at least five (5) calendar days prior to the date proposed for the start of excavation. The CONTRACTOR shall not submit the request until all required safety/shoring plans have been reviewed and the notifications required have been completed.
- D. The CONTRACTOR shall number the requests consecutively as directed by the RESIDENT ENGINEER. When the excavation is authorized a copy of the authorization shall be posted near the excavation and protected from rain or damage. The Competent Person responsible for the excavation shall have a copy of the authorization available at all times that work is underway in the excavation.
- E. Authorization to proceed with the excavation shall not relieve the CONTRACTOR of any responsibilities for conducting the work in a safe manner and meeting all the requirements of Construction Safety Orders for Excavations.

EXHIBIT 1

REQUEST FOR AUTHORIZATION TO PROCEED WITH EXCAVATION (SEE FOLLOWING PAGE)

REQUEST FOR AUTHORIZATION TO PROCEED WITH EXCAVATION

CONTRACTOR: _____

DATE: _____ REQUEST NO. _____

DATES OF EXCAVATION: _____ FROM: _____ TO: _____
(MAXIMUM FOUR (4) WEEKS. IF EXCAVATION MUST CONTINUE A NEW AUTHORIZATION MUST BE OBTAINED.)

DESCRIPTION OF EXCAVATION: _____

SKETCH OF EXCAVATION LOCATION: (INDICATE PLANT NORTH AND COORDINATES)

NAME OF COMPETENT PERSON IN CHARGE OF EXCAVATION: _____
EXCAVATION GREATER THAN 4 FT DEEP: ___ YES ___ NO, MAXIMUM DEPTH: ___ FEET
SPECIAL CONDITIONS:

CAL OSHA PERMIT RECEIVED: _____ CALL USA NOTIFIED: _____

SAFETY PLAN/TRENCH SHORING PLAN SUBMITTED _____

U.G. FACILITY OWNERS NOTIFIED: _____ (DATE OF APPROVAL/NOTIFICATION TO BE ENTERED)

SIGNATURE: _____
CONTRACTOR'S AUTHORIZED REPRESENTATIVE _____ DATE _____

RESIDENT ENGINEER AUTHORIZATION TO PROCEED

CONTRACTOR IS AUTHORIZED TO PROCEED WITH THE WORK DESCRIBED ABOVE. CM ASSUMES NO RESPONSIBILITY FOR THE EXECUTION OF THE WORK.

SPECIAL CONDITIONS OR PROCEDURES TO BE OBSERVED FOR THIS EXCAVATION:

AS-BUILT DRAWINGS ARE REQUIRED FOR THE INSTALLATION OF ALL TEMPORARY OR PERMANENT UNDERGROUND PIPELINES, DUCT BANKS AND CABLES.

SIGNATURE: _____ DATE _____
RESIDENT ENGINEER _____

**** END OF SECTION ****

**SECTION 01 07 00
ABBREVIATIONS OF INSTITUTIONS**

PART 1 -- GENERAL

1.1_ GENERAL

A. Wherever in these Specifications references are made to the standards, specifications, or other published data of the various international, national, regional, or local organizations, such organizations may be referred to by their acronym or abbreviation only. As a guide to the user of these Specifications, the following acronyms or abbreviations which may appear in these Specifications shall have the meanings indicated herein.

1.2 ABBREVIATIONS

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.
AGA	American Gas Association
AGMA	American Gear Manufacturer's 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
API	American Petroleum Institute
APWA	American Public Works Association
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
ASQC	American Society for Quality Control
ASSE	American Society of Sanitary Engineers
ASTM	American Society for Testing and Materials
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
CBM	Certified Ballast Manufacturers
CEMA	Conveyors 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
EIA	Electronic Industries Association
ETL	Electrical Test Laboratories
FPL	Forest Products Laboratory
HI	Hydraulics Institute
ICBO	International Conference of Building Officials
IEEE	Institute of Electrical and Electronics Engineers
IES	Illuminating Engineering Society
IME	Institute of Makers of Explosives
IOS	International Organization for Standardization
IP	Institute of Petroleum (London)
IPC	Institute of Printed Circuits
IPCEA	Insulated Power Cable Engineers Association
ISA	Instrument Society of America
ITE	Institute of Traffic Engineers
MBMA	Metal Building Manufacturer's Association
MPTA	Mechanical Power Transmission Association
MTI	Marine Testing Institute
NAAMM	National Association of Architectural Metal Manufacturer's
NACE	National Association of Corrosion Engineers
NBS	National Bureau of Standards
NCCLS	National Committee for Clinical Laboratory Standards
NEC	National Electrical Code
NEMA	National Electrical Manufacturer's Association
NFPA	National Fire Protection Association
NFPA	National Forest Products Association
NLGI	National Lubricating Grease Institute
NMA	National Microfilm Association
NRCA	National Roofing Contractors Association
NWMA	National Woodwork Manufacturers Association
OSHA	Occupational Safety and Health Administration
PCA	Portland Cement Association
RIS	Redwood Inspection Service
RVIA	Recreational Vehicle Industry Association
RWMA	Resistance Welder Manufacturer's Association
SAE	Society of Automotive Engineers
SAMA	Scientific Apparatus Makers Association
SMA	Screen Manufacturers Association
SMACCNA	Sheet Metal and Air Conditioning Contractors National Association
SPIB	Southern Pine Inspection Bureau
SPR	Simplified Practice Recommendation
SSA	Swedish Standards Association
SSBC	Southern Standard Building Code, Southern Building Code Congress
SSPC	Steel Structures Painting Council
SSPWC	Standard Specifications for Public Works Construction
TAPPI	Technical Association of the Pulp and Paper Industry
TFI	The Fertilizer Institute
UBC	Uniform Building Code
UL	Underwriters Laboratories, Inc.
WCLIB	West Coast Lumber Inspection Bureau

WCRSI	Western Concrete Reinforcing Steel Institute
WIC	Woodwork Institute of California
WRI	Wire Reinforcement Institute, Inc.
WWPA	Western Wood Products Association

PART 2 -- PRODUCTS (Not Used)

PART 3 -- EXECUTION (Not Used)

**** END OF SECTION ****

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**SECTION 01 09 00
REFERENCE STANDARDS**

PART 1 - GENERAL

1.1 GENERAL

- A. Titles of Sections and Paragraphs: Captions accompanying specification sections and paragraphs are for convenience of reference only, and do not form a part of the Specifications.
- B. Applicable Publications: Whenever in these Specifications references are made to published specifications, codes, standards, or other requirements, it shall be understood that wherever no date is specified, only the latest specifications, standards, or requirements of the respective issuing agencies which have been published as of the date that the WORK is advertised for bids, shall apply; except to the extent that said standards or requirements may be in conflict with applicable laws, ordinances, or governing codes. No requirements set forth herein or shown on the Drawings shall be waived because of any provision of, or omission from, said standards or requirements.
- C. Specialists, Assignments: In certain instances, specification text requires (or implies) that specific work is to be assigned to specialists or expert entities, who must be engaged for the performance of that work. Such assignments shall be recognized as special requirements over which the CONTRACTOR has no choice or option. These requirements shall not be interpreted so as to conflict with the enforcement of building codes and similar regulations governing the WORK; also they are not intended to interfere with local union jurisdiction settlements and similar conventions. Such assignments are intended to establish which party or entity involved in a specific unit of work is recognized as "expert" for the indicated construction processes or operations. Nevertheless, the final responsibility for fulfillment of the entire set of contract requirements remains with the CONTRACTOR.

1.2 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

- A. Without limiting the generality of other requirements of the Specifications, all work specified herein shall conform to or exceed the requirements of applicable codes and the applicable requirements of the following documents.
- B. References herein to "Building Code" or "Uniform Building Code" or "International Building Code" or "CA Building Code" shall mean Uniform Building Code of the International Conference of Building Officials (ICBO) or the International Building Code of the International Code Council (ICC). Similarly, references to "Mechanical Code" or "Uniform or International Mechanical Code", "Plumbing Code" or "Uniform or International Plumbing Code", "Fire Code" or "Uniform or International Fire Code," shall mean Uniform or International Mechanical Code, Uniform or International Plumbing Code and Uniform or International Fire Code of the International Conference of the Building Officials (ICBO) or the International Code Council (ICC). "Electric Code" or "National Electric Code" (NEC) shall mean the National Electric Code of the National Fire Protection Association (NFPA). The latest edition of the codes as approved by the Municipal Code and used by the local agency as of the date that the WORK is advertised for bids, as adopted by the agency having jurisdiction, shall apply to the WORK herein, including all addenda, modifications, amendments, or other lawful changes thereto.

- C. In case of conflict between codes, reference standards, drawings and the other Contract Documents, the order of precedence as listed in the Whitebook shall govern. In those cases where a conflict cannot be resolved by utilizing the order of precedence, the most stringent requirements shall govern. All conflicts shall be brought to the attention of the RESIDENT ENGINEER for clarification and directions prior to ordering or providing any materials or furnishing labor. The CONTRACTOR'S bid shall reflect the most stringent Contract Document requirements.
- D. The CONTRACTOR shall construct the WORK specified herein in accordance with the requirements of the Contract Documents and the referenced portions of those referenced codes, standards, and specifications listed herein.
- E. Applicable Standard Specifications: References in the Contract Documents to "Standard Specifications" or SSPWC shall mean the Standard Specifications for Public Works Construction, 2015 edition, including the 2015 Whitebook and Supplemental Special Provisions.
- F. References herein to "OSHA Regulations for Construction" shall mean **Title 29, Part 1926, Construction Safety and Health Regulations**, Code of Federal Regulations (OSHA), including all changes and amendments thereto.
- G. References herein to "OSHA Standards" shall mean **Title 29, Part 1910, Occupational Safety and Health Standards**, Code of Federal Regulations (OSHA), including all changes and amendments thereto.
- H. Applicable Safety Standards: References herein to "Cal-OSHA" shall mean **State of California, Department of Industrial Relations, Construction Safety Orders**, as amended to date, and all changes and amendments thereto.

1.3 QUALITY ASSURANCE

- A. Conform to reference standard by date of issue current on date for receiving bids.
- B. Should the specified reference standards conflict with the Contract Documents, refer to paragraph 1.2 (c) of this Section.

1.4 SCHEDULE OF REFERENCES

AA	ALUMINUM ASSOCIATION 1400 Crystal Drive. Arlington, VA 22202 703.358.2960 www.aluminum.org
AABC	ASSOCIATED AIR BALANCE COUNCIL 1518 K Street, Suite 503 Washington, DC 20005 202.737.0202 www.aabc.com
AASHTO	AMERICAN ASSOCIATION OF STATE HIGHWAY and Transportation Officials 444 North Capitol Street, N.W., Suite 249 Washington, DC 20001 202.624.5800

www.transportion.org

- ABMA AMERICAN BEARING MANUFACTURERS ASSOCIATION
(formerly the Antifriction Bearing Manufacturers Association)
2025 M. Street, NW, Suite 800
Washington DC, 20036
202.367.1155
www.americanbearings.org
- ACI AMERICAN CONCRETE INSTITUTE
38800 Country Club Drive
Farmington Hills, MI 48331
248.848.3700
www.concrete.org
- ADC AIR DUCT COUNCIL
(formerly the Air Diffusion Council)
1901 N. Roselle Road, Suite 800
Schaumburg, IL 60195
847.706.6750
www.flexibleduct.org
- AGA AMERICAN GAS ASSOCIATION
400 North Capital Street, NW, Suite 450
Washington, DC 20001
202.824.7000
www.aga.org
- AGC ASSOCIATED GENERAL CONTRACTOR'S OF AMERICA
2300 Wilson Blvd, Suite 300
Arlington, VA 22201
703.548.3118
www.agc.org
- AGMA AMERICAN GEAR MANUFACTURERS ASSOCIATION
1001 N. Fairfax Street, Suite 500
Alexandria, VA 22314
703.684.0211
www.agma.org
- AHRI AIR-CONDITIONING, HEATING AND REFRIGERATION INSTITUTE
2111 Wilson Blvd, Suite 500
Arlington, VA 22201
703.524.8800
www.ahrinet.org
- Note: This organization includes what was formerly known as the
Hydronics Institute and the Gas Appliance Manufacturers Association.
- AI ASPHALT INSTITUTE
2696 Research Park Drive
Lexington, KY 40511
859.288.4960
www.asphaltinstitute.org

- AIA AMERICAN INSTITUTE OF ARCHITECTS
1735 New York Avenue, NW
Washington, DC 20006
800.242.3837
www.aia.org
- AISC AMERICAN INSTITUTE OF STEEL CONSTRUCTION
130 East Randolph, Suite 2000
Chicago, IL 60601
312.670.2401
www.aisc.org
- AISI AMERICAN IRON AND STEEL INSTITUTE
25 Massachusetts Ave., NW, Suite 800
Washington, DC 20001
202.452.7100
www.steel.org
- AITC AMERICAN INSTITUTE OF TIMBER CONSTRUCTION
7012 S. Revere Parkway, Suite 140
Centennial, CO 80112
303.792.9559
www.aitc-glulam.org
- AMCA AIR MOVEMENT AND CONTROL ASSOCIATION
30 West University Drive
Arlington Heights, IL 60004
847.394.0150
www.amca.org
- ANSI AMERICAN NATIONAL STANDARDS INSTITUTE
1899 "L" Street, NW, 11th Floor
Washington, DC, 20036
202.293.8020
www.ansi.org
- APA AMERICAN PLYWOOD ASSOCIATION
7011 S. 19th Street
Tacoma, WA 98466
253.565.6600
www.apawood.org
- API AMERICAN PETROLEUM INSTITUTE
1220 L. Street, N.W.
Washington, DC 20005
202.682.8000
www.api.org
- ASCE AMERICAN SOCIETY OF CIVIL ENGINEERS
1801 Alexander Bell Drive
Reston, VA 20191
800.548.2723
703.295.6300
www.asce.org

ASHRAE AMERICAN SOCIETY OF HEATING, REFRIGERATING AND
AIR CONDITIONING ENGINEERS
1791 Tullie Circle, N.E.
Atlanta, GA 30329
800.527.4723
www.ashrae.org

ASME AMERICAN SOCIETY OF MECHANICAL ENGINEERS
Two Park Avenue
New York, NY 10016-5990
800.843.2763
973.882.1170
www.asme.org

ASTM AMERICAN SOCIETY FOR TESTING AND MATERIALS
100 Barr Harbor Drive
West Conshohocken, PA 19428
610.832.9500
www.astm.org

AWC AMERICAN WOOD COUNCIL
(formerly the National Forest Products Association; NFPA)
222 Catoctin Circle SE, Suite 201
Leesburg, VA 20175
202.463.2766
www.awc.org

AWI ARCHITECTURAL WOODWORK INSTITUTE
46179 Westlake Drive, Suite 120
Potomac Falls, VA 20165
571.323.3636
www.awinet.org

AWPA AMERICAN WOOD-PRESERVERS' ASSOCIATION
100 Chase Park South, Suite 116
Birmingham, AL 35244
205.733.4077
www.awpa.com

AWS AMERICAN WELDING SOCIETY
8669 NW 36th Street, Suite 130.
Miami, FL 33166
800.443.9353
305.443.9353
www.aws.org

AWWA AMERICAN WATER WORKS ASSOCIATION
6666 West Quincy Avenue
Denver, CO 80235
303.794.7711
www.awwa.org

BIA BRICK INSTITUTE OF AMERICA
12007 Sunrise Valley Drive, Suite 430

Reston, VA 20191
703.620.0010
www.gobrick.com

- CDA COPPER DEVELOPMENT ASSOCIATION, INC.
260 Madison Avenue
New York, NY 10016
212.251.7200
www.copper.org
- CLFMI CHAIN LINK FENCE MANUFACTURERS INSTITUTE
10015 Old Columbia Road, Suite B215
Columbia, MD 21046
301.596.2583
www.chainlinkinfo.org
- CRSI CONCRETE REINFORCING STEEL INSTITUTE
933 North Plum Grove Road
Schaumburg, IL 60173
847.517.1200
www.crsi.org
- CSSB CEDAR SHAKE & SHINGLE BUREAU
(formerly the Red Cedar Shingle and Handsplit Shake Bureau)
US Address:
P.O. Box 1178
Sumas, WA 98295
- also
Canadian Address:
#2-7101 Home Street
Mission, BC V2V 7A2
604.820.7700
www.cedarbureau.org
- DHI DOOR AND HARDWARE INSTITUTE
14150 Newbrook Drive, Suite 200
Chantilly, VA 20151
703.222.2010
www.dhi.org
- EJCDC ENGINEERS JOINT CONTRACT DOCUMENTS COMMITTEE
6701 Cavalier Drive
Alexandria, VA 22307
www.ejcdc.org
- EJCDC documents can be obtained by contacting:
American Council of Engineering Companies
1015 15th Street, N.W.
Washington, DC 20005
202.347.7474
www.acec.org
- EJMA EXPANSION JOINT MANUFACTURERS ASSOCIATION
(Technical Inquiry)

25 North Broadway
Tarrytown, NY 10591
914.332.0040
www.ejma.org

- GANNA GLASS ASSOCIATION OF NORTH AMERICA
(formerly the Flat Glass Marketing Association; FGMA)
800 sw Jackson Street, Suite 812
Topeka, KS 66612
785.271.0208
www.glasswebsite.com
- FM FACTORY MUTUAL (APPROVALS)
1151 Boston-Providence Turnpike
P.O. Box 9102
Norwood, MA 02062
781.762.4300
www.fmapprovals.com
- FS FEDERAL SPECIFICATION
General Services Administration
- Note: Federal Specifications can be purchased from:
TECHSTREET
6300 Interfirst Drive
Ann Arbor, MI 48108
800.699.9277
www.techstreet.com
- GA GYPSUM ASSOCIATION
6525 Belcrest Road, Suite 480
Hyattsville, MD 20782
301.277.8686
www.gypsum.org
- JIC JOINT INDUSTRIAL COUNCIL
c/o National Machine Tool Builders Association
7901 Westpark Drive
McLean, VA 22102
800.248.6862
703.356.9810
www.ntma.org
- IBA INSTITUTE OF BOILER AND RADIATOR MANUFACTURERS
(formerly known as the Hydronics Institute)
(IBA was incorporated into the Gas Appliance Manufacturers Association)
(refer to the AHRI listing above)
- ICBO INTERNATIONAL CONFERENCE OF BUILDING OFFICIALS
5360 Workman Mill Road
Whittier, CA 90601
800.284.4406
562.699.0541

IEEE	INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS 3 Park Avenue, 17 th Floor New York, NY 10016 800.678.4333 212.419.7900 www.ieee.org
IGMA	INSULATING GLASS MANUFACTURERS ASSOCIATION 27 N. Wacker Drive, Suite 365 Chicago, IL 60606 613.233.1510 www.igmaonline.org
IMIAC	INTERNATIONAL MASONRY INDUSTRY ALL-WEATHER COUNCIL International Masonry Institute 815 15th Street, N.W. Washington, DC 20005
MBMA	METAL BUILDING MANUFACTURER'S ASSOCIATION 1300 Sumner Avenue Cleveland, OH 44115 216.241.7333 www.mbma.com
MFMA	MAPLE FLOORING MANUFACTURERS ASSOCIATION, INC. One Parkview Plaza, Suite 800 Oakbrook Terrace, IL 60181 888.4809138 www.maplefloor.org
MIL	MILITARY SPECIFICATIONS Naval Publications and Forms Center 5801 Tabor Avenue Philadelphia, PA 19120
ML/SFA	METAL LATH/STEEL FRAMING ASSOCIATION 221 North LaSalle Street Chicago, IL 60601
NAAMM	NATIONAL ASSOCIATION OF ARCHITECTURAL METAL MANUFACTURERS 800 Roosevelt Road, Building "C", Suite 312 Glen Ellyn, IL 60137 630.942.6591 www.naamm.org
NCMA	NATIONAL CONCRETE MASONRY ASSOCIATION 13750 Sunrise Valley Drive Herndon, VA 22071 703.713.1900 www.ncma.org
NEBB	NATIONAL ENVIRONMENTAL BALANCING BUREAU 8575 Grovemont Circle Gaithersburg, MD 20877

	301.977.3698 www.nebb.org
NEC	NATIONAL ELECTRIC CODE (this is a publication of the NFPA) (refer to the NFPA listing below)
NEMA	NATIONAL ELECTRICAL MANUFACTURERS' ASSOCIATION 1300 North 17 th Street, Suite 900 Arlington, VA 22209 703.841.3200 www.nema.org
NFPA	NATIONAL FIRE PROTECTION ASSOCIATION Battery March Park Quincy, MA 02269 Quincy, MA 02169 800.344.3555 617.770.3000 www.nfpa.org
NSWMA	NATIONAL SOLID WASTES MANAGEMENT ASSOCIATION 4301 Connecticut Avenue NW, Suite 300 Washington, DC 20008 202.244.4700
PCA	PORTLAND CEMENT ASSOCIATION 5420 Old Orchard Road Skokie, IL 60077 847.966.6200 www.cement.org
PCI	PRECAST/PRESTRESSED CONCRETE INSTITUTE 200 West Adams Street, Suite 2100 Chicago, IL 60606 312.786.0300 www.pci.org
PS	PRODUCT STANDARD U.S. Department of Commerce Washington, DC 20203
RIS	REDWOOD INSPECTION SERVICE 818 Grayson Road, Suite 201 Pleasant Hill, CA 94523 925.935.1499 www.redwoodinspection.com
SDI	STEEL DECK INSTITUTE P.O. Box 426 Glenshaw, PA 15116 412.487.3325 www.sdi.org

- SDI STEEL DOOR INSTITUTE
20300 Detroit Road
Westlake, OH 44145
440.899.0010
www.steeldoor.org
- SJI STEEL JOIST INSTITUTE
234 W. Cheves Street
Florence, SC 29501
843.407.4091
www.steeljoist.org
- SMACNA SHEET METAL AND AIR CONDITIONING CONTRACTOR'S
National Office
4201 Lafayette Center Drive
Chantilly, VA 20151
703.803.2980
www.smacna.org
- SSPC STEEL STRUCTURES PAINTING COUNCIL
800 Trumbull Drive
Pittsburgh, PA 15205
877.281.7772
412.281.2331
www.sspc.org
- TCA TILE COUNCIL OF NORTH AMERICA, INC.
100 Clemson Research Blvd
Anderson, SC 29625
864.646.8453
www.tcnatile.com
- TPI TURFGRASS PRODUCERS INTERNATIONAL
(formerly the American Sod Producers Association; ASPA)
2 East Main Street
East Dundee, IL 60118
847.649.5555
www.turfgrasssod.org
- UL UNDERWRITERS' LABORATORIES, INC.
USA Corporate Headquarters
333 Pfingston Road
Northbrook, IL 60062
847.272.8800
www.ul.com
- WCLIB WEST COAST LUMBER INSPECTION BUREAU
6980 S.W. Varns
Tigard, OR 97223
503.639.0651
www.wclib.org
- WDMA WINDOW AND DOOR MANUFACTURERS ASSOCIATION
(formerly the National Woodwork Manufacturers Association; NWMA)
2025 "M" Street, NW, Suite 800

Washington, DC. 20036
202.367.1157
www.wdma.com

WWPA

WESTERN WOOD PRODUCTS ASSOCIATION
1500 SW First Avenue, Suite 870
Portland, OR 97204
503.224.3939
www.wwpa.org

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**SECTION 01 30 00
CONTRACTOR SUBMITTALS**

PART 1 -- GENERAL

1.1 GENERAL

- A. Wherever submittals are required hereunder, all such submittals by the CONTRACTOR shall be submitted to the RESIDENT ENGINEER.
- B. Within seven (7) calendar days after the date of commencement as stated in the Notice to Proceed (NTP), the CONTRACTOR shall submit the following items to the RESIDENT ENGINEER for review:
 - 1. A preliminary schedule of Shop Drawings, Samples, and submittals listed in the Bid.
 - 2. A list of all permits and licenses the CONTRACTOR shall obtain indicating the agency required to grant the permit and the expected date of submittal for the permit and required date for receipt of the permit.
- C. At the preconstruction conference, the CONTRACTOR shall submit the following items to the RESIDENT ENGINEER for review:
 - 1. A 60-day plan of operation in accordance with Greenbook/Whitebook.
 - 2. A project overview bar chart in accordance with Greenbook/Whitebook.
 - 3. A preliminary schedule of values in accordance with Greenbook/Whitebook.

1.2 SHOP DRAWINGS

- A. Wherever called for in the Contract Documents, or where required by the RESIDENT ENGINEER, the CONTRACTOR shall furnish to the RESIDENT ENGINEER for review, 6 copies, plus the number the CONTRACTOR wants returned, not to exceed 12 copies, plus one reproducible copy, of each shop drawing submittal. The term "Shop Drawings" as used herein shall be understood to include detail design calculations, shop drawings, fabrication, and installation drawings, erection drawings, lists, graphs, catalog sheets, data sheets, and similar items.
- B. All shop drawing submittals shall be accompanied by the RESIDENT ENGINEER's standard submittal transmittal form. The form may be obtained from the RESIDENT ENGINEER. Any submittal not accompanied by such a form, or where all applicable items on the form are not completed, will be returned for resubmittal.
- C. Normally, a separate transmittal form shall be used for each specific item or class of material or equipment for which a submittal is required. Transmittal of a submittal of various items using a single transmittal form will be permitted only when the items taken together constitute a manufacturer's "package" or are so functionally related that expediency indicates review of the group or package as a whole. A multiple-page submittal shall be collated into sets, and each set shall be stapled or bound, as appropriate, prior to transmittal to the RESIDENT ENGINEER.

- D. Except as may otherwise be indicated herein, the RESIDENT ENGINEER will return prints of each submittal to the CONTRACTOR with its comments noted thereon, within 15 calendar days following their receipt by the RESIDENT ENGINEER. It is considered reasonable that the CONTRACTOR shall make a complete and acceptable submittal to the RESIDENT ENGINEER by the second submission of a submittal item. The OWNER reserves the right to withhold monies due the CONTRACTOR to cover additional costs of the RESIDENT ENGINEER's review beyond the second submittal. The RESIDENT ENGINEER'S maximum review period for each submittal, including all resubmittals, will be 15 days per submittal. In other words, for a submittal that requires two resubmittals before it is complete, the maximum review period for that submittal could be 45 days.
- E. If three (3) copies of a submittal are returned to the CONTRACTOR marked "NO EXCEPTIONS TAKEN," formal revision and resubmission of said submittal will not be required.
- F. If three (3) copies of a submittal are returned to the CONTRACTOR marked "MAKE CORRECTIONS NOTED," formal revision and resubmission of said submittal will not be required.
- G. If a submittal is returned to the CONTRACTOR marked "AMEND-RESUBMIT," the CONTRACTOR shall revise said submittal and shall resubmit the required number of copies of said revised submittal to the RESIDENT ENGINEER.
- H. If a submittal is returned to the CONTRACTOR marked "REJECTED-RESUBMIT," the CONTRACTOR shall revise said submittal and shall resubmit the required number of copies of said revised submittal to the RESIDENT ENGINEER.
- I. Fabrication of an item shall be commenced only after the RESIDENT ENGINEER has reviewed the pertinent submittals and returned copies to the CONTRACTOR marked either "NO EXCEPTIONS TAKEN" or "MAKE CORRECTIONS NOTED." Corrections indicated on submittals shall be considered as changes necessary to meet the requirements of the Contract Documents and shall not be taken as the basis for changes to the contract requirements.
- J. All CONTRACTOR shop drawing submittals shall be carefully reviewed by an authorized representative of the CONTRACTOR, prior to submission to the RESIDENT ENGINEER. Each submittal shall be dated, signed, and certified by the CONTRACTOR, as being correct and in strict conformance with the Contract Documents. In the case of shop drawings, each sheet shall be so dated, signed, and certified. No consideration for review by the RESIDENT ENGINEER of any CONTRACTOR submittals will be made for any items which have not been so certified by the CONTRACTOR. All non-certified submittals will be returned to the CONTRACTOR without action taken by the RESIDENT ENGINEER, and any delays caused thereby shall be the total responsibility of the CONTRACTOR.
- K. The RESIDENT ENGINEER's/ENGINEER's review of CONTRACTOR shop drawing submittals is for general conformance with the design concept and contract documents only and shall not relieve the CONTRACTOR of the entire responsibility for the correctness of details and dimensions. The CONTRACTOR shall assume all responsibility and risk for any misfits due to any errors in CONTRACTOR submittals. The CONTRACTOR shall be responsible for the dimensions and the design of adequate connections and details. Markings or comments shall not be construed as relieving the Contractor from compliance with the project plans and specifications or departures therefrom. The contractor remains responsible for details and accuracy for

confirming and correlating all quantities and dimensions, for selecting fabrication processes, the techniques of assembly, and for performing his work in a safe manner.

1.3 CONTRACTOR'S SCHEDULE

- A. The CONTRACTOR's construction schedules and reports shall be prepared and submitted to the RESIDENT ENGINEER.

1.4 SAMPLES

- A. Whenever in the Specifications samples are required, the CONTRACTOR shall submit not less than three (3) samples of each such item or material to the RESIDENT ENGINEER for acceptance at no additional cost to the OWNER.
- B. Samples, as required herein, shall be submitted for acceptance a minimum of 21 days prior to ordering such material for delivery to the jobsite, and shall be submitted in an orderly sequence so that dependent materials or equipment can be assembled and reviewed without causing delays in the WORK.
- C. All samples shall be individually and indelibly labeled or tagged, indicating thereon all specified physical characteristics and Manufacturer's name for identification and submitted to the RESIDENT ENGINEER for acceptance. Upon receiving acceptance of the RESIDENT ENGINEER, one set of the samples will be stamped and dated by the RESIDENT ENGINEER and returned to the CONTRACTOR, and one set of samples will be retained by the RESIDENT ENGINEER, and one set of samples shall remain at the job site until completion of the WORK.
- D. Unless indicated otherwise, all colors and textures of specified items presented in sample submittals shall be from the manufacturer's standard colors and standard materials, products, or equipment lines. If the samples represent non-standard colors, materials, products, or equipment lines and their selection will require an increase in contract time or price, the CONTRACTOR will clearly indicate same on the transmittal page of the submittal.

1.5 OWNER'S MANUALS (OR OPERATION AND MAINTENANCE MANUALS)

- A. The CONTRACTOR shall submit technical operation and maintenance information for each item of mechanical, electrical and instrumentation equipment in an organized manner in the OWNER'S MANUALS (OR OPERATION AND MAINTENANCE MANUALS). The OWNER'S MANUALS (OR OPERATION AND MAINTENANCE MANUALS) shall be written so that it can be used and understood by the OWNER'S operation and maintenance staff. Each individual force main and the generator shall have its own independent and unique OWNER'S MANUAL (OR OPERATION AND MAINTENANCE MANUALS).
- B. Each OWNER'S MANUAL (OR OPERATION AND MAINTENANCE MANUALS) shall be subdivided first by specification section number; second, by equipment item; and last, by "part." "Parts" shall conform to the following (as applicable):
 - 1. Part 1 - Equipment Summary:
 - a. Summary: A summary table shall indicate the equipment name, equipment number, and process area in which the equipment is installed.

- b. Form: The RESIDENT ENGINEER will supply an Equipment Summary Form for each item of mechanical, electrical and instrumentation equipment in the WORK. The CONTRACTOR shall fill in the relevant information on the form and include it in Part 1.
 2. Part 2 - Operational Procedures:
 - a. Procedures: Manufacturer-recommended procedures on the following shall be included in Part 2:
 - Installation
 - Adjustment
 - Startup
 - Location of controls, special tools or other equipment required or related instrumentation needed for operation
 - Operation Procedures
 - Load Changes
 - Calibration
 - Shutdown
 - Troubleshooting
 - Disassembly
 - Reassembly
 - Realignment
 - Testing to determine performance efficiency
 - Tabulation of proper settings for all pressure relief valves, low and high pressure switches and other protection devices
 - List of all electrical relay settings including alarm and contact settings
3. Part 3 - Preventive Maintenance Procedures:
 - a. Procedures: Preventive maintenance procedures shall include all manufacturer-recommended procedures to be performed on a periodic basis, both by removing and replacing the equipment or component and by leaving the equipment in place.
 - b. Schedules: Recommended frequency of preventive maintenance procedures shall be included. Lubrication schedules, including lubricant SAE grade and type, and temperature ranges shall be covered.
4. Part 4 - Parts List:
 - a. Parts List: A complete parts list shall be furnished, including a generic description and manufacturer's identification number for each part. Addresses and telephone numbers of the nearest supplier and parts warehouse shall be included.
 - b. Drawings: Cross-sectional or exploded view drawings shall accompany the parts list.
5. Part 5 - Wiring Diagrams:
 - a. Diagrams: Part 5 shall include complete internal and connection wiring diagrams for electrical equipment items.

6. Part 6 - Shop Drawings:
 - a. Drawings: This part shall include approved shop or fabrication drawings, complete with dimensions.
 7. Part 7- Safety:
 - a. Procedures: This part describes the safety precautions to be taken when operating and maintaining the equipment or working near it.
 8. Part 8 – Documentation:
 - a. All equipment warranties, affidavits, and certifications required by the Technical Specifications shall be placed in this part.
- C. For each force main and the generator, the CONTRACTOR shall furnish to the RESIDENT ENGINEER seven (7) identical OWNER'S MANUALS (OR OPERATION AND MAINTENANCE MANUALS). Each set shall consist of one or more volumes, each of which shall be bound in a standard size, 3-ring, loose-leaf, vinyl plastic hard cover binder suitable for bookshelf storage. Binder ring size shall not exceed 2.5 inches. A table of contents indicating all equipment in the manuals shall be prepared.
- D. OWNER'S MANUALS (OR OPERATION AND MAINTENANCE MANUALS) shall be submitted in final form to the RESIDENT ENGINEER not later than the 75 percent of construction completion date. All discrepancies found by the RESIDENT ENGINEER in the OWNER'S MANUALS (OR OPERATION AND MAINTENANCE MANUALS) shall be corrected by the CONTRACTOR within 15 calendar days from the date of written notification by the RESIDENT ENGINEER.
- E. Incomplete or unacceptable OWNER'S MANUALS (OR OPERATION AND MAINTENANCE MANUALS) at the 75 percent construction completion point shall constitute sufficient justification to withhold the amount stipulated in paragraph "OWNER'S MANUAL (OR OPERATION AND MAINTENANCE MANUALS) Submittals" of Section 01700, from any monies due the CONTRACTOR.

1.6 INSTRUCTION OF OWNER'S PERSONNEL

A. General:

1. Training is not generally a part of the contract, unless it is specifically called out in the technical specifications. If the OWNER determines that certain training is desired on a particular component or a portion of the contract not required of the technical specifications, a field order or change order will be executed in order to facilitate such training for the wastewater collections staff.

1.7 ELECTRONIC DOCUMENT SUBMITTAL REQUIREMENTS

A. General:

1. All final submittals are required in both paper and electronic format. Four (4) copies of each final submittal shall be provided on compact disk media (CD-ROM).
 2. Where preliminary submittals are required in electronic format, three (3) copies of the preliminary submittal shall be provided on CD-ROM for review.
 3. CD-ROM disks shall be on high-quality CD-R media. CDs shall have printed paper labels with the project name, CIP Number, CONTRACTOR, and content. CD-RW (CD-rewritable) disks are not acceptable. CDs shall be provided with a case and a case insert label displaying the same information shown on the CD label.
 4. The CD-ROM data format shall comply with ISO 9660 (2010) with Joliet extensions.
 5. Deviation from this standard will be accepted only if advance approval is given by the RESIDENT ENGINEER.
- B. Documents: Electronic submittals for the following types of documents are required as a minimum. Additional requirements are identified in the equipment specifications.
1. Design:
 - a) Design Specifications
 - b) Design Drawings and record drawings
 2. Operations and Maintenance:
 - a) Facility design O&M manuals
 - (1) Volume I - process information
 - (2) Volume II - standard operating procedures (SOP)
 - (3) Volume III - all maintenance information for the facility
 - b) Manufacturer O&M manuals
 - c) Facility Loop and Wiring Diagrams
 3. Environmental Documents:
 4. Research & Development:
- C. Format:
1. Construction drawings and record drawings developed under the Contract shall be in Bentley Microstation (DGN V8 version) format. All drawings shall conform to the CADD and Drafting standards set forth in the City's CADD Standards, latest edition.
 2. Other than construction drawings and record drawings, documents shall be in Adobe Acrobat PDF format, using the Acrobat version as specified by the RESIDENT ENGINEER. Documents that are submitted in Acrobat Image Only format will not be accepted.
 3. Electronic Conversion: Vendor and CONTRACTOR shop drawings developed under the Contract shall be in Bentley Microstation (DGN) format. Documents in electronic format (Microsoft Word, Excel, etc.) shall be

converted to standard PDF format using the Acrobat printer driver or other direct conversion software. The Acrobat PDF sub-format for electronically converted documents shall be the Acrobat Standard PDF file format which includes both image and text information.

4. Documents not available in electronic format shall be scanned at 300 dpi, bitonal (black and white) and converted into Adobe Acrobat (PDF). Image enhancement software shall be used during scanning. The Acrobat PDF sub-format for scanned documents shall be the Original Image with Hidden Text format.
5. All PDF documents shall be reviewed, and corrected if necessary, for orientation and legibility.
6. Individual document files shall not exceed 3 megabytes in size. Large documents shall be broken down by subsections to facilitate this requirement

D. Document Organization and Indexing:

1. Electronic submittals shall be logically organized. File names shall be in UPPERCASE only, use a maximum of 64 characters, contain no spaces, and clearly indicate the file contents.
2. Supplier's submittals that include O&M documentation for more than one equipment type shall be divided into separate documents for each equipment type.
3. Each document's Table of Contents shall contain PDF bookmarks which actively link to the referenced sections within the document.
4. A master PDF index file shall be included, with a master Table of Contents, and active internal links to individual document files. The master PDF index file shall be clearly identifiable. External PDF link file names shall be in uppercase only.
5. A table shall be provided and submitted in spreadsheet format which includes the information about each document file. The contents of the table shall be submitted and approved by the RESIDENT ENGINEER. An example of information to be provided is as follows: (This is an example only)
 - a) Document file name
 - b) Document title and description
 - c) Hard Copy Catalog No. (used by facility document coordinator)
 - d) Document Type: (see above)
 - e) Facility Name
 - f) Specification Number
 - g) Process Name
 - h) Unit Process Number
 - i) Manufacturer's Name (if applicable)
 - j) Supplier's Name (if applicable)
 - k) EMPAC asset number (if applicable)
 - l) Asset Description (if applicable)
 - (1) Keyword
 - (2) Qualifier

1.8 SPARE PARTS LIST

- A. The CONTRACTOR shall furnish to the RESIDENT ENGINEER five (5) identical sets of spare parts information for all mechanical, electrical, and instrumentation equipment. The spare parts list shall include the current list price of each spare part. The spare parts list shall be limited to those spare parts which each manufacturer recommends be maintained by the OWNER in inventory at the plant site. Each manufacturer or supplier shall indicate the name, address, and telephone number of its nearest outlet of spare parts to facilitate the OWNER in ordering. The CONTRACTOR shall cross-reference all spare parts lists to the equipment numbers designated in the Contract Documents. The spare parts lists shall be bound in standard size, 3-ring, loose-leaf, vinyl plastic hard cover binders suitable for bookshelf storage. Binder ring size shall not exceed 2.5 inches.

1.9 RECORD DRAWINGS (one component of the Project Master Record Documents as identified in specification section 01 05 00)

- A. The CONTRACTOR shall keep and maintain, at the job site, one record set of Drawings. On these, it shall mark all project conditions, locations, configurations, and any other changes or deviations which may vary from the details represented on the original Contract Drawings, including buried or concealed construction and utility features which are revealed during the course of construction. Special attention shall be given to recording the horizontal and vertical location of all buried utilities that differ from the locations indicated, or which were not indicated on the Contract Drawings. Said record drawings shall be supplemented by any detailed sketches as necessary or directed to indicate, fully, the WORK as actually constructed. These master record drawings of the CONTRACTOR's representation of as-built conditions, including all revisions made necessary by addenda and change orders shall be maintained up-to-date during the progress of the WORK.

Copies of the record drawings shall be submitted on the 20th working day of every month after the month in which the notice to proceed is given as well as on completion of WORK. Failure to submit complete record drawings on or before the 20th working day will enact the liquidated damages clause for interim record drawings submittals described in Article 3 of the Agreement.

- B. In the case of those drawings which depict the detail requirement for equipment to be assembled and wired in the factory, such as motor control centers and the like, the record drawings shall be updated by indicating those portions which are superseded by change order drawings or final shop drawings, and by including appropriate reference information describing the change orders by number and the shop drawings by manufacturer, drawing, and revision numbers.
- C. Record drawings shall be accessible to the RESIDENT ENGINEER at all times during the construction period.
- D. Final payment will not be acted upon until the CONTRACTOR-prepared record drawings have been delivered to the RESIDENT ENGINEER. Said up-to-date record drawings shall be in the form of a set of prints with carefully plotted information overlaid in red.
- E. Upon substantial completion of the WORK and prior to final acceptance, the CONTRACTOR shall finalize and deliver a complete set of record drawings to the RESIDENT ENGINEER for transmittal to the OWNER, conforming to the construction records of the CONTRACTOR. This set of drawings shall consist of corrected

drawings showing the reported location of the WORK. The information submitted by the CONTRACTOR in the Record Drawings will be assumed to be correct, and the CONTRACTOR shall be responsible for the accuracy of such information, and for any errors or omissions which may appear on the Record Drawings as a result.

- F. Please also refer to specification section 01050 – FIELD ENGINEERING for Project Master Record Document requirements. Please note that the specifications are the other component of the Project Master Record Documents.

PART 2 -- PRODUCTS (Not Used)

PART 3 -- EXECUTION (Not Used)

**** END OF SECTION ****

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**SECTION 01 32 33
CONSTRUCTION PHOTOGRAPHIC AND VIDEO DOCUMENTATION**

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Administrative and procedural requirements for:
 - 1. Preconstruction photographs.
 - 2. Periodic construction photographs.
 - 3. Final completion construction photographs.
 - 4. Preconstruction video recordings.
 - 5. Periodic construction video recordings.
- B. Submit preconstruction photographs or videos to Owner's Representative before Work is performed which has potential to disturb or modify public or private property not owned by Owner.
- C. Failure by Contractor to submit preconstruction photographs or videos may be taken by Owner as evidence subsequent claims by property owners for damage to their property can be rightfully attributed to Contractor's actions.

1.2 RELATED WORK

- A. Section 01 33 00: Contractor Submittals
- B. Section 01 40 00: Quality Control
- C. Section 01 60 00: Products, Materials, Equipment and Substitutions
- D. Section 01 70 00: Project Closeout

1.4 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workmen trained and experienced in necessary trades and crafts and completely familiar with specified requirements and methods for proper performance of Work of this section.

1.5 SUBMITTALS

- A. The following minimum photographic or video documentation shall be required.
 - 1. One submittal of preconstruction photographs and videos taken before start of Work.
 - 2. One submittal of periodic construction photographs or videos taken every month Contractor is on site.
 - 3. One submittal of final completion construction photographs or videos.

B. Owner's Representative may require any one of the following combinations of photographic or video documentation.

1. Key plan plus digital photographs plus construction photographic paper prints.
2. Key plan plus digital photographs plus video recordings and transcripts.
3. Key plan plus construction photographic paper prints plus video recordings and transcripts.

C. Submittals shall meet the following requirements.

SUBMITTAL	DESCRIPTION	
Key Plan	Key plan of Project site with notation of vantage points marked for location and direction of each photograph. Indicate elevation or story of construction. Include same information as corresponding photographic documentation. Submit key plan with each digital or construction photograph submittal.	
Digital Photographs	Submit image files within 3 days of taking photographs. Use digital camera with minimum sensor resolution of 8 megapixels. Format: Minimum 3200 by 2400 pixels, in unaltered original files, with same aspect ratio as sensor, uncropped, date and time stamped, in folder named by date of photograph, accompanied by key plan file. Identification: Provide the following information with each image description in file metadata tag: Name of Project. Name and contact information of photographer. Name of Owner and Owner's Representative. Name of Contractor. Date photograph was taken. Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction. Unique sequential identifier keyed to accompanying key plan.	
Construction Photograph Paper Prints	On Owner's request, submit 2 prints of each photographic view within 7 working days of taking photographs. Format: 8"x10" smooth-surface matte prints on single-weight, commercial-grade photographic paper; enclosed back to back in clear plastic sleeves punched for standard 3-ring binder. Identification: On back of each print, provide applied label or rubber-stamped impression with the following information: Name of Project. Name and contact information of photographer. Name of Owner and Owner's Representative. Name of Contractor. Date photograph was taken if not date stamped by camera. Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction. Unique sequential identifier keyed to accompanying key plan.	
Video Recordings	Submit video recordings within 7 days of recording. Submit video recordings in digital video disc format acceptable to Owner's Representative. With each submittal, provide the following information:	

SUBMITTAL	DESCRIPTION	
	Project Name. Name and contact information of photographer. Name of Owner and Owner's Representative. Name of Contractor. Date video recording was recorded. Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction. Weather conditions at time of recording.	
Video Recording Transcript	Prepared on 8-1/2"x11" paper, punched and bound in heavy-duty, 3-ring, vinyl-covered binders. Mark appropriate identification on front and spine of each binder. Include cover sheet with same label information as corresponding video recording. Include name of Project and date of video recording on each page.	

1.6 UNIT PRICES

- A. Payment for Work in this section shall be included as part of lump-sum or unit-price bid amount for which such Work is appurtenant.
- B. Base number of construction photographs on average of 30 photographs per week over duration of Work plus one preconstruction video, one post construction video and one additional video per month over Work duration.

PART 2 - PRODUCTS

2.2 MATERIALS

- A. Refer to Section 01 60 00 for basic requirements for products and materials.
- B. Digital images shall be in JPG format, produced by a digital camera with minimum sensor size of 8 megapixels, and at an image resolution of not less than 3200 by 2400 pixels.
- C. Digital video recordings shall be high-resolution, digital video disc in format acceptable to Owner's Representative.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Obtain and transfer copyright usage rights from photographer to Owner for unlimited reproduction of photographic documentation.

3.2 PHOTOGRAPHY

- A. Take photographs using maximum range of depth of field. Photographs shall be in focus and clearly show Work. Photographs with blurry or out-of-focus areas will not be accepted.

- B. Maintain key plan with each set of construction photographs that identifies each photographic location.
- C. Submit digital images exactly as originally recorded in digital camera, without alteration, manipulation, editing, or modifications using image-editing software.
 - 1. Include date and time in file name for each image.
 - 2. Maintain one set of images accessible in field office at Project site, available at all times for reference. Identify images in same manner as those submitted to Owner's Representative.

3.3 CONSTRUCTION VIDEO RECORDINGS

- A. Mount camera on tripod before starting recording unless otherwise necessary to show area of construction. Display continuous running time and date. At start of each video recording, record weather conditions from local newspaper or television and actual temperature reading at Project site.
- B. Describe scenes on video recording by audio narration by microphone while video recording is in progress. Include description of items being viewed, recent events, and planned activities. At each change in location, describe vantage point, location, direction (by compass point), and elevation or story of construction.
 - 1. Confirm date and time at beginning and end of recording.
 - 2. Begin each video narration with name of Project, Contractor's name, videographer's name, and Project location.
- C. Provide printed transcript of narration. Display images and running time captured from video recording opposite corresponding narration segment.

3.4 PRECONSTRUCTION PHOTOGRAPHS

- A. Before commencement of excavation and/or demolition, take photographs of Project site and surrounding properties, including existing items to remain during construction, from different vantage points, as directed by Owner's Representative.
- B. Photographs shall be of sufficient quality and thoroughness to fully document preexisting damage or wear to photographed property for which Contractor or Owner might be asked to compensate property owner were it not for photographic evidence of preexisting damage. Where existing cracks in concrete, masonry or other materials are wider than thickness of a dime, include dime or similar visual standard in photo or video for reference.
- C. Flag excavation areas and construction limits before taking construction photographs.
- D. Take 20 photographs to show existing conditions adjacent to property before starting Work.
- E. Take 20 photographs of existing buildings either on or adjoining property to accurately record physical conditions at start of construction.

- F. Take additional photographs as required to record settlement or cracking of adjacent structures, pavements, and improvements.

3.5 PRECONSTRUCTION VIDEOS

- A. Before starting excavation and/or demolition, record video recording of Project site and surrounding properties from different vantage points, as directed by Owner's Representative.
- B. Videos shall be of sufficient quality and thoroughness to fully document preexisting damage or wear to video-recorded property for which Contractor or Owner might be asked to compensate property owner were it not for video evidence of preexisting damage. Where existing cracks in concrete, masonry or other materials are wider than thickness of a dime, include a dime or similar visual standard in photo or video for reference.
- C. Flag excavation areas and construction limits before recording construction video recordings.
- D. Show existing conditions adjacent to Project site before starting Work.
- E. Show existing buildings either on or adjoining Project site to accurately record physical conditions at start of excavation and/or demolition.
- F. Show protection efforts by Contractor.

3.6 PERIODIC CONSTRUCTION PHOTOGRAPHS

- A. Periodic Construction Photographs: Take 30 photographs weekly, with timing each month adjusted to coincide with cutoff date associated with each Application for Payment. Select vantage points to show status of construction and progress since last photographs were taken.
- B. Take photographs of all Work to be covered or buried prior to covering or burying. Photographs shall show all subgrade, geotextiles, conduit, utilities, steel reinforcement, fasteners, embedments, bare concrete surfaces, decking, framing, insulation, piping, ductwork, wiring or other work subsequently covered.
- C. Where structural members are fabricated off site, provide photographic documentation of fabrication in sufficient detail and quantity to show all work not visible at time of delivery to jobsite.
- D. Where on-site events may result in construction damage or losses, take photographs as needed to document damage or losses.
- E. From time to time, Owner's Representative will instruct photographer about number and frequency of photographs and general directions on vantage points. Select actual vantage points and take photographs to show status of construction and progress since last photographs were taken.

3.7 PERIODIC CONSTRUCTION VIDEOS

- A. Record video recording monthly, coinciding with cutoff date associated with each Application for Payment. Select vantage points to show status of construction and progress since last video recording. Minimum recording time shall be 30 minutes.

3.8 FINAL COMPLETION CONSTRUCTION PHOTOGRAPHS

- A. Take 30 color photographs after date of Substantial Completion for submission as project record documents. Owner's Representative will inform photographer of desired vantage points.
- B. Do not include date stamp on final completion construction photographs.

**** END OF SECTION ****

**SECTION 01 40 00
QUALITY CONTROL**

PART 1 -- GENERAL

1.1 DEFINITION

- A. Specific quality control requirements for the WORK are indicated throughout the Contract Documents. The requirements of this Section are primarily related to performance of the WORK beyond furnishing of manufactured products. The term "Quality Control" includes inspection, sampling and testing, and associated requirements.

1.2 PROJECT QUALITY CONTROL PLAN

- A. The CONTRACTOR is responsible for producing WORK to meet the quality required by the Contract Documents and to perform the quality control efforts necessary to ensure those requirements are met. The RESIDENT ENGINEER's inspection of any WORK will not relieve the CONTRACTOR of the primary responsibility for such efforts.
- B. The CONTRACTOR shall submit to the RESIDENT ENGINEER a Quality Control Plan for review and approval within 14 days of the Notice to Proceed. The submittal must be approved before construction WORK begins. The Quality Control Plan will include:
 - 1. A description of the workings and structure of the CONTRACTOR's Quality Control Plan that will be implemented to assure quality WORK will be done.
 - 2. A contract specific Inspection Plan that lists and describes the inspections that the CONTRACTOR will conduct, their frequency, acceptance criteria, and who will conduct each inspection. The Inspection Plan shall include the WORK to be performed by subcontractors, fabricators, and suppliers.
 - 3. Identification of the individuals within the CONTRACTOR's organization who are responsible for quality assurance including their role and authority.
- C. After completion of the RESIDENT ENGINEER's review of the CONTRACTOR's Quality Control Plan, the CONTRACTOR and RESIDENT ENGINEER will meet to discuss and define quality standards and expectations and to coordinate the RESIDENT ENGINEER's inspection efforts with the CONTRACTOR's planned efforts.
- D. The CONTRACTOR will be obligated to accommodate procedural changes to contract required quality control issues requested by the RESIDENT ENGINEER.

1.3 FACTORY INSPECTION AND TESTS

- A. The CONTRACTOR shall be responsible for inspection and testing of materials, products, or equipment at the place of manufacture at its own expense when required, by the Special Provisions, Regulatory Permits, Codes, or as noted in the plans or specifications. The CONTRACTOR shall provide and bear all costs for inspection and for witnessing factory tests by the OWNER'S/RESIDENT ENGINEER'S

representatives as nominated by the OWNER for the number of days indicated for such inspections and observations. These costs shall include travel expenses, and expenses for lodging, meals, and car rental if the place of manufacture, fabrication and factory testing is more than fifty (50) miles outside the geographical limit of the City. If air travel is involved, it shall include economy-class tickets. Costs paid by the CONTRACTOR for inspection and for witnessing factory tests shall not include the salaries or salary-related expenses of the inspectors.

- B. Where the Plans and/or Technical Specifications indicate that factory inspection and witnessing of testing by the OWNER/RESIDENT ENGINEER is optional or discretionary, the OWNER will pay for travel and related costs associated with such inspection and witnessing of tests by the OWNER'S/RESIDENT ENGINEER'S representatives.
- C. The presence of the OWNER'S/RESIDENT ENGINEER'S representatives at the place of manufacture shall not relieve the CONTRACTOR of the responsibility for furnishing materials, products, and equipment which comply with all requirements of the Contract Documents. The CONTRACTOR is obligated to meet the requirements of the Contract Documents, and any act or omission on the part of the OWNER/RESIDENT ENGINEER shall not relieve the CONTRACTOR of the obligation to fulfill the requirements of its Contract.
- E. When tests fail to meet the specified requirements, retesting because of non-conformance to specified requirements shall be performed by the same testing laboratory as directed by the OWNER/RESIDENT ENGINEER. The CONTRACTOR shall bear all costs for such retesting, including costs for additional trips for factory inspection
- F. For samples and tests required by the CONTRACTOR for its own quality assurance program and needs, whether or not specified in the Contract Documents, costs shall be included in the Contract Price.
- G. All tests required by the specifications, regulatory permits, or referenced codes and standards shall be the responsibility of the CONTRACTOR, unless specifically noted otherwise.

1.4 SAMPLING AND TESTING

- A. Unless otherwise indicated, all sampling and testing shall be in accordance with the methods prescribed in the current standards of the ASTM, as applicable to the class and nature of the material, product, or equipment considered; however, the OWNER will use any generally-accepted system of sampling and testing which will insure that the quality of the workmanship is in full agreement with the Contract Documents.
- B. Any waiver by the OWNER of any specific testing or other quality assurance measures, whether or not such waiver is accompanied by a guarantee of substantial performance as a relief from the specified testing or other quality assurance requirements as originally specified, and whether or not such guarantee is accompanied by a performance bond to assure execution of any necessary corrective or remedial work, shall not be construed as a waiver of any requirements of the Contract Documents.

- C. Notwithstanding the existence of such waiver, the RESIDENT ENGINEER will make independent investigations and tests; and failure of any portion of the WORK to meet any of the requirements of the Contract Documents shall be reasonable cause for the RESIDENT ENGINEER to require the removal or correction and reconstruction of any such work in accordance with the Contract Documents.

1.5 INSPECTION AND TESTING LABORATORY SERVICE

- A. If required, the OWNER will provide and pay for the services of an independent testing laboratory to perform routine testing of earth work and concrete at the site, (i.e. soil density; concrete strength, slump, and air content) and perform random tests of other areas previously completed and inspected by CONTRACTOR.
- B. The OWNER's testing laboratory will perform other inspections, testing, and other services specified in the Contract Documents, to be performed by the OWNER, or as required by the RESIDENT ENGINEER. The cost of these services will be paid for by the OWNER.
- C. Reports will be submitted by the OWNER's testing laboratory to the RESIDENT ENGINEER in duplicate, indicating observations and results of tests, and indicating compliance or non-compliance with Contract Documents.
- D. The CONTRACTOR shall cooperate with the RESIDENT ENGINEER and OWNER's testing laboratory by furnishing samples of materials, concrete design mix, equipment, tools, storage and other assistance as requested.
- E. The CONTRACTOR shall notify the RESIDENT ENGINEER 24 hours prior to the expected time for operations requiring inspection and laboratory testing services.
- F. Retesting required because of non-conformance to specified requirements shall be performed by the same testing laboratory as directed by the RESIDENT ENGINEER. The CONTRACTOR shall bear all costs from such retesting at no additional cost to the OWNER.
- G. For samples and tests required for the CONTRACTOR's use, the CONTRACTOR shall make arrangements with an independent firm for payment and scheduling of testing. The cost of sampling and testing for the CONTRACTOR'S use shall be included in the Contract Price.
- H. All tests required by the specifications or referenced codes and standards are the responsibility of the CONTRACTOR, unless specifically noted otherwise.

1.6 SPECIAL INSPECTION

- A. The Uniform Building Code/International Building Code/CA Building Code requires that special inspections be performed on certain structural elements of the project. The RESIDENT ENGINEER will perform all on-site special inspections required by the Uniform Building Code/International Building Code/CA Building Code. The cost of these services when provided during normal WORK hours will be paid for by the OWNER.

- B. When building components are fabricated off site, the CONTRACTOR must utilize a fabricator approved by the City of San Diego Development Services Department. If the CONTRACTOR elects to utilize a fabricator that is not approved by the City of San Diego Development Services Department, the CONTRACTOR shall provide a special inspector to perform continuous special inspection in the fabricator's shop. The CONTRACTOR shall be responsible for all costs associated with performing special inspection in the fabricator's shop.

PART 2 -- PRODUCTS (Not used)

PART 3 -- EXECUTION

3.1 INSTALLATION

- A. Inspection: The CONTRACTOR shall inspect materials or equipment upon arrival on the job site and immediately prior to installation. The CONTRACTOR shall reject damaged and defective items. This inspection shall include a review of Contract requirements; a check to assure that all materials and/or equipment have been tested, submitted, and approved; examination of the work area to ascertain that all preliminary work has been completed; and a physical examination of materials and equipment to assure that they conform to reviewed shop drawings or submittal data. This inspection shall also include instruction as necessary to assure that workmen know the requirements of the Contract as they pertain to the feature, an examination of the quality of workmanship, as well as a review of control testing for compliance with the Contract requirements.
- B. Measurements: The CONTRACTOR shall verify measurements and dimensions of the WORK, as an integral step of starting each installation.
- C. Special Procedures: Methods and facilities shall be provided to assure conformance with requirements for special process specifications such as welding, heat treating and nondestructive testing of materials. Certifications for personnel, procedures, and equipment shall be maintained as required to meet the requirement of the Contract Documents and all applicable codes.
- D. Manufacturer's Instructions: Where installations include manufactured products, the CONTRACTOR shall comply with manufacturer's applicable instructions and recommendations for installation, to whatever extent these are more explicit or more stringent than applicable requirements indicated in Contract Documents.

3.2 MANUFACTURER'S FIELD INSTALLATION SERVICES AND REPORTS

- A. When specified in individual specification sections, the CONTRACTOR shall require material or product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, (test, adjust, and balance of equipment) and to provide instructions when necessary.
- B. The CONTRACTOR shall report to the RESIDENT ENGINEER in writing any observations and site decisions or instructions given by the manufacturers'

representative to the CONTRACTOR that are supplemental or contrary to manufacturers' written instructions.

- C. The CONTRACTOR shall submit manufacturer representative's reports (in duplicate) within seven (7) calendar days of each field visit, to the RESIDENT ENGINEER for review. If duration of field visit is greater than one week, submit weekly reports. The final report shall certify that equipment or system has been satisfactorily installed and is functioning correctly.

**** END OF SECTION ****

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**SECTION 01 50 50
MOBILIZATION**

PART 1 -- GENERAL

1.1 GENERAL

- A. Mobilization shall include the obtaining of all permits; moving onto the sites of all plant and equipment; furnishing and erecting plants, temporary buildings, and other construction facilities; and implementing security requirements; all as required for the proper performance and completion of the WORK. Mobilization shall include the following principal items, if required:
1. Moving on to the site of all CONTRACTOR's plant and equipment required for first month operations.
 2. Installing temporary construction power, wiring, and lighting facilities.
 3. Developing construction water supply.
 4. Providing field office trailers for the CONTRACTOR, if so desired, complete with all furnishings and utility services.
 5. Providing all on-site communication facilities, including telephones, cordless phone antenna, and radio pagers.
 6. Providing on-site sanitary facilities and potable water facilities.
 7. Arranging for and erection of CONTRACTOR's work and storage yard.
 8. Constructing and implementing security features and requirements.
 9. Obtaining all required permits.
 10. Having all OSHA-required notices and establishment of safety programs.
 11. Having the CONTRACTOR's superintendent at the job site full-time.
 12. Submitting initial submittals.
- B. Contract Drawing G-5 indicates the general location and limits of a Contractor's Laydown and Staging area that City has pre-approved for Contractor's use to perform the WORK of this contract. Contractor may, at his/her option, obtain additional laydown/staging area(s), but shall do so at no additional cost to City.
- C. Vehicular access to the project site shall be by means of City streets. The nearest City streets are Cactus Road, and Siempre Viva Road.
- D. Contractor's construction work shall be confined within the limits of the existing site fencing for this lift station plus the limits of the indicated laydown/staging area.

1.2 PAYMENT FOR MOBILIZATION

- A. The CONTRACTOR's attention is directed to the condition that no payment for mobilization, or any part thereof will be approved for payment under the Contract until all mobilization items listed above have been completed as specified.

PART 2 -- PRODUCTS (Not Used)

PART 3 -- EXECUTION (Not Used)

**** END OF SECTION ****

**SECTION 01 51 00
TEMPORARY UTILITIES**

PART 1 -- GENERAL

1.1 GENERAL REQUIREMENTS

- A. Types: Typically, the types of utility services required for general temporary use at the project sites include the following:
- Water service (potable for certain uses)
 - Storm sewer
 - Sanitary sewer
 - Electric power service
 - Telephone service

1.2 JOB CONDITIONS

- A. Scheduled Uses: The CONTRACTOR shall, in conjunction with establishment of job progress schedule, establish a schedule for implementation and termination of service for each temporary utility or facility; at earliest feasible time, and when acceptable to OWNER AND RESIDENT ENGINEER, change over from use of temporary utility service to permanent service, if required.

PART 2 -- PRODUCTS

2.1 MATERIALS

- A. The CONTRACTOR shall provide either new or used materials and equipment, which are in substantially undamaged condition and without significant deterioration and which are recognized in the construction industry, by compliance with appropriate standards, as being suitable for intended use in each case. Where a portion of temporary utility is provided for CONTRACTOR by utility company, the CONTRACTOR shall provide remainder with matching and compatible materials and equipment and comply with recommendations of the utility company.

PART 3 -- EXECUTION

3.1 INSTALLATION OF TEMPORARY UTILITY SERVICES

- A. General: Wherever feasible, the CONTRACTOR shall engage the utility company to install temporary service to project, or as a minimum, to make connection to existing utility service; locate services where they will not interfere with total project construction WORK, including installation of permanent utility services; and maintain temporary services as installed for required period of use; and relocate, modify or extend as necessary from time to time during that period as required to accommodate total project construction WORK.
- B. Approval of Electrical Connections: All temporary connections for electricity shall be subject to the approval of the RESIDENT ENGINEER and the power company representative, and shall be removed in like manner at the CONTRACTOR's expense prior to final acceptance of the WORK.

- C. Separation of Circuits: Unless otherwise permitted by the RESIDENT ENGINEER, circuits separate from lighting circuits shall be used for all power purposes.
- D. Construction Wiring: All wiring for temporary electric light and power shall be properly installed and maintained and shall be securely fastened in place. All electrical facilities shall conform to the requirements of Title 8, Industrial Relations, Subchapter 5, Electrical Safety Orders, California Administrative Code; and Subpart K of the OSHA Safety and Health Standards for Construction.

3.2 INSTALLATION OF POWER DISTRIBUTION SYSTEM

- A. Power: The CONTRACTOR shall provide all necessary power required for its operations under the Contract, and shall provide and maintain all temporary power lines required to perform the WORK in a safe and satisfactory manner.
- B. Temporary Power Distribution: The CONTRACTOR shall provide a weatherproof, grounded, temporary power distribution system sufficient to accommodate performance of entire WORK of project, including, but not necessarily limited to, temporary electrical heating where indicated, operation of test equipment and test operation of building equipment and systems which cannot be delayed until permanent power connections are operable, temporary operation of other temporary facilities, including permanent equipment and systems which must be placed in operation prior to use of permanent power connections (pumps, HVAC equipment, elevators, and similar equipment), and power for temporary operation of existing facilities (if any) at the site during change-over to new permanent power system. Provide circuits of adequate size and proper power characteristics for each use; run circuit wiring generally overhead, and rise vertically in locations where it will be least exposed to possible damage from construction operations, and result in least interference with performance of the WORK; provide rigid steel conduit or equivalent raceways for wiring which must be exposed on grade, floors, decks, or other recognized exposures to damage or abuse.

3.3 INSTALLATION OF LIGHTING

- A. Construction Lighting: All WORK conducted at night or under conditions of deficient daylight shall be suitably lighted to insure proper WORK and to afford adequate facilities for inspection and safe working conditions.
- B. Temporary Lighting: The CONTRACTOR shall provide a general, weatherproof, grounded temporary lighting system in every area of construction work, as soon as overhead floor/roof deck structure has been installed; and provide sufficient illumination for safe work and traffic conditions; and run circuit wiring generally overhead, and rise vertically in locations where it will be least exposed to possible damage from construction operations on grade, floors, decks, or other recognized areas of possible damage or abuse.

3.4 WATER SUPPLY

- A. General: The CONTRACTOR shall coordinate with the Public Utilities Department (PUD) for obtaining water service connection and shall allow a three-month notice to the Water Department. The CONTRACTOR shall provide all facilities necessary to

convey the water from the source to the points of use in accordance with the requirements of the Contract Documents.

The water capacity charge and the wet tap fees shall be paid by the OWNER. The CONTRACTOR shall pay the fee for water meter and all other charges for water use.

- B. The CONTRACTOR shall provide and operate all pumping facilities, pipelines, valves, hydrants, storage tanks, and all other equipment necessary for the adequate development and operation of the water supply system. Water used for domestic purposes shall be free of contamination and shall conform to the requirements of the State and local authorities for potable water. The CONTRACTOR shall be solely responsible for the adequate functioning of its water supply system and shall be solely liable for any claims arising from the use of same, including discharge or waste of water therefrom.
- C. Water Connections: The CONTRACTOR shall not make connection to, or draw water from, any fire hydrant or pipeline without first obtaining permission of the authority having jurisdiction over the use of said fire hydrant or pipeline and from the agency owning the affected water system. For each such connection made, the CONTRACTOR shall first attach to the fire hydrant or pipeline a valve and a meter, if required by the said authority, of a size and type acceptable to said authority and agency. The CONTRACTOR shall pay all permit and water charges.

3.5 INSTALLATION OF SANITARY FACILITIES

- A. Toilet Facilities: Fixed or portable chemical toilets shall be provided wherever needed for the use of CONTRACTOR's employees. Toilets at construction job sites shall conform to the requirements of Subpart D, Section 1926.51 of the OSHA Standards for Construction.
- B. Sanitary and Other Organic Wastes: The CONTRACTOR shall establish a regular daily collection of all sanitary and organic wastes. All wastes and refuse from sanitary facilities provided by the CONTRACTOR or organic material wastes from any other source related to the CONTRACTOR's operations shall be disposed of away from the site in a manner satisfactory to the RESIDENT ENGINEER and in accordance with all laws and regulations pertaining thereto.

3.6 INSTALLATION OF FIRE PROTECTION

- A. Fire Protection: The construction plant and all other parts of the WORK shall be connected with the CONTRACTOR's water supply system and shall be adequately protected against damage by fire. Hose connections and hose, water casks, chemical equipment, or other sufficient means shall be provided for fighting fires in the temporary structures and other portions of the WORK, and responsible persons shall be designated and instructed in the operation of such fire apparatus so as to prevent or minimize the hazard of fire. The CONTRACTOR's fire protection program shall conform to the requirements of Article 34, Section 1805, b of Cal-OSHA, and Subpart F of the OSHA Standards for Construction.

3.7 OPERATIONS AND TERMINATIONS

- A. Inspections: Prior to placing temporary utility services into use, the CONTRACTOR shall inspect and test each service and arrange for governing authorities' required inspection and tests, and obtain required certifications and permits for use thereof.

- B. Protection: The CONTRACTOR shall maintain distinct markers for underground lines, and protect from damage during excavating operations.
- C. Termination and Removal: When need for a temporary utility service or a substantial portion thereof has ended, or when its service has been replaced by use of permanent services, or not later than time of substantial completion, the CONTRACTOR shall promptly remove installation unless requested by RESIDENT ENGINEER to retain it for a longer period. The CONTRACTOR shall complete and restore WORK which may have been delayed or affected by installation and use of temporary utility, including repairs to construction and grades and restoration and cleaning of exposed surfaces.
- D. Removal of Water Connections: Before final acceptance of the WORK on the project, all temporary connections and piping installed by the CONTRACTOR shall be entirely removed, and all affected improvements shall be restored to their original condition, or better, to the satisfaction of the RESIDENT ENGINEER and to the agency owning the affected utility.

** END OF SECTION **

**SECTION 01 52 10
CONSTRUCTION SECURITY**

PART 1 -- GENERAL

1.1 SECURITY PROGRAM

A. The requirements of this section pertain to protection of Contractor's equipment, materials, tools, and other items associated with construction of the WORK of this contract. Subsequent to completion of construction, CONTRACTOR's construction security measures shall be removed from the lift station site.

B. The CONTRACTOR shall:

1. Protect the WORK including all field office trailers and their contents from theft, vandalism, and unauthorized entry.
2. Initiate a site security system and program, at the time of mobilization onto the work-site, which provides adequate security for site stored and installed material, product, and equipment. The RESIDENT ENGINEER will approve the security system. Considerations for the security program shall include, but not be limited to, the following:
 - a) Submit security reports monthly to RESIDENT ENGINEER.
 - b) Provide a 6-foot high, dark green-screened (full height) perimeter fence with locked-gate for access, if required.
 - c) Provide perimeter lighting, if required, spaced at an interval of 20 feet illuminated all night at 50 foot-candle, minimum.
 - d) Provide high-security, locked box containers in the fenced area for material storage, or off-site approved, bonded storage area.
 - e) Ensure that structures designed with security locks must be capable of being secured with temporary or permanent high-security locks prior to installation.
3. Maintain the security program throughout the Contract duration.
4. Be responsible at all times for security of the storage compound and lay-down areas, and for all Contractor plant, material, equipment, and tools, as well as, for those belonging to subcontractors.
5. Provide the RESIDENT ENGINEER with a list of 24-hour emergency telephone numbers.
6. Submit to the RESIDENT ENGINEER an up-dated progressive inventory of materials, equipment, and tools when received on-site.

1.2 ENTRY CONTROL

A. The CONTRACTOR shall:

1. Restrict entry of unauthorized personnel and vehicles onto the project or work site.
 2. Maintain copies of vehicle insurance cards or other proof of insurance on-site for vehicles permitted on-site.
 3. Require vehicle passes when vehicles are on-site.
 4. Allow entry only to authorized persons with proper identification.
 5. Maintain an Employee/Visitor Log, and make the log available to the RESIDENT ENGINEER on request. The log shall be submitted to the RESIDENT ENGINEER monthly, or as necessary.
 6. Give jobsite security orientation training to all affected employees including subcontractor employees. Employee participation in the security orientation shall be acknowledged by their respective individual signatures affixed to an orientation roster.
- B. The RESIDENT ENGINEER has the right to refuse access to the site or request that a person or vehicle be removed from the site if found violating any project security rules.

1.3 RESTRICTIONS

- A. The CONTRACTOR shall not allow cameras on site, or photographs to be taken except with prior approval of the OWNER.

1.4 PROJECT SITE SECURITY SERVICES

- A. The CONTRACTOR shall:
1. Provide project site security to control entry to the project sites.
 2. Monitor the passage of personnel, vehicles, materials, and equipment entering and leaving the project site. License plates of vehicles permitted to enter the project site shall be recorded.
 3. Patrol the project sites to observe and report unauthorized entry or activities.
- B. Requirements: At the request of the RESIDENT ENGINEER, the CONTRACTOR shall perform duties as follows:
1. Direct emergency vehicles or equipment to a pre-designated on-site location.
 2. Verify vehicle passes and personnel badges.
 3. Direct personnel, vehicles, materials, and equipment to the proper area.
 4. Direct traffic as requested by the RESIDENT ENGINEER including off-site traffic as may be required.
 5. Monitor security for equipment and/or material temporarily stored along the access road or in the parking area.

6. Maintain an Employee/Visitor Log and direct visitors to the proper offices of the RESIDENT ENGINEER or CONTRACTOR for authorization to enter the site.
7. Maintain records of insurance files for all vehicles permitted on-site.
8. Maintain security report files.
9. Notify on a daily basis the RESIDENT ENGINEER of security violations, and enter all facts regarding the incident in a Security Log. The Security Log shall be transmitted to the RESIDENT ENGINEER.
10. Upon approval by the OWNER, the CONTRACTOR shall assist the RESIDENT ENGINEER to remove personnel denied access to the site for violation of site regulations.
11. Enforce parking area regulations and site speed limit, and obtain the name/vehicle license number of violators and report violators to the RESIDENT ENGINEER.
12. Inspect area lighting on a daily basis and report deficiencies to the RESIDENT ENGINEER.
13. Call the RESIDENT ENGINEER to report a fire, hazardous material spill, or medical emergency. Report the emergency to the fire department as directed by the RESIDENT ENGINEER.
14. Notify the RESIDENT ENGINEER of all unusual activities/occurrences.

PART 2 -- PRODUCTS

2.1 CONTRACTOR SECURITY PLAN

- A. Prior to the performance of any work the CONTRACTOR shall submit to the RESIDENT ENGINEER for review and comment two copies of security plan commensurate with the needs of the project, and signed by an officer of the CONTRACTOR. Adequacy of the security plan is the responsibility of the CONTRACTOR. The RESIDENT ENGINEER will not review the CONTRACTOR security plan for adequacy.
- B The security plan shall:
 1. Include employee site security orientation program.
 2. Include security measures to protect CONTRACTOR employees and other persons from injury, prevent material damages, or avoid financial losses.
 3. Cover security procedures related to CONTRACTOR tools and equipment that shall be mobilized for the WORK.

PART 3 -- EXECUTION (Not Used)

**** END OF SECTION ****

**SECTION 01 53 00
PROTECTION OF EXISTING FACILITIES**

PART 1 -- GENERAL

1.1 GENERAL

- A. The CONTRACTOR shall protect all existing utilities and improvements not designated for removal and shall restore damaged or temporarily relocated utilities and improvements to a condition equal to or better than they were prior to such damage or temporary relocation, all in accordance with requirements of the Contract Documents.
- B. The CONTRACTOR shall verify the exact locations and depths of all utilities shown and the CONTRACTOR shall make exploratory excavations of all utilities that may interfere with the WORK. All such exploratory excavations shall be performed as soon as practicable after award of the contract (including issuance of Notice to Proceed) and, in any event, a sufficient time in advance of construction to avoid possible delays to the CONTRACTOR's work. When such exploratory excavations show the utility location as shown to be in error, the CONTRACTOR shall so notify the RESIDENT ENGINEER.
- C. The number of exploratory excavations required shall be that number which is sufficient to determine the alignment and grade of the utility.

1.2 RIGHTS-OF-WAY

- A. The CONTRACTOR shall not do any work that would affect any oil, gas, sewer, or water pipeline; any telephone, telegraph, communications or electric transmission line; any fence; or any other structure, or improvement, nor shall the CONTRACTOR enter upon the rights-of-way involved until notified by the RESIDENT ENGINEER that the OWNER has secured authority therefor from the proper party. After authority has been obtained, the CONTRACTOR shall give said party due notice of its intention to begin work, if required by said party, and shall remove, shore, support or otherwise protect such pipeline, transmission line, ditch, fence, or structure or replace the same.
- B. When two or more contracts are being executed at one time on the same or adjacent land in such manner that work on one contract may interfere with that on another, the OWNER shall determine the sequence and order of the WORK. When the territory of one contract is the necessary or convenient means of access for the execution of another contract, such privilege of access or any other reasonable privilege may be granted by the OWNER to the CONTRACTOR so desiring, to the extent, amount, in the manner, and at the times permitted. No such decision as to the method or time of conducting the WORK or the use of territory shall be made the basis of any claim for delay or damage, except as provided for temporary suspension of the WORK in accordance with the provisions of this Contract.

1.3 PROTECTION OF STREET OR ROADWAY MARKERS

- A. The CONTRACTOR shall not destroy, remove, or otherwise disturb any existing survey markers or other existing street or roadway markers without proper authorization. No pavement breaking or excavation shall be started until all survey or other permanent marker points that will be disturbed by the construction operations have been properly referenced. All survey markers or points disturbed by the CONTRACTOR shall be accurately restored after all street or roadway resurfacing has been completed.

1.4 RESTORATION OF PAVEMENT

- A. General: All paved areas including asphaltic concrete berms cut or damaged during construction shall be replaced with similar materials and of equal thickness to match the existing adjacent undisturbed areas, except where specific resurfacing requirements have been called for in the Contract Documents or in the requirements of the agency issuing the permit. All temporary and permanent pavement shall conform to the requirements of the affected pavement owner. All pavements which are subject to partial removal shall be neatly saw cut in straight lines.
- B. Temporary Resurfacing: Wherever required by the public authorities having jurisdiction, the CONTRACTOR shall place temporary surfacing promptly after backfilling and shall maintain such surfacing for the period of time fixed by said authorities before proceeding with the final restoration of improvements.
- C. Permanent Resurfacing: In order to obtain a satisfactory junction with adjacent surfaces, the CONTRACTOR shall saw cut back and trim the edge so as to provide a clean, sound, vertical joint before permanent replacement of an excavated or damaged portion of pavement. Damaged edges of pavement along excavations and elsewhere shall be trimmed back by saw cutting in straight lines. All pavement restoration and other facilities restoration shall be constructed to finish grades compatible with adjacent undisturbed pavement.
- D. Restoration of Sidewalks or Private Driveways: Wherever sidewalks or private roads have been removed for purposes of construction, the CONTRACTOR shall place suitable temporary sidewalks or roadways promptly after backfilling and shall maintain them in satisfactory condition for the period of time fixed by the authorities having jurisdiction over the affected portions before proceeding with the final restoration or, if no such period of times is so fixed, the CONTRACTOR shall maintain said temporary sidewalks or roadways until the final restoration thereof has been made.

1.5 EXISTING UTILITIES AND IMPROVEMENTS

- A. General: The CONTRACTOR shall protect all underground utilities and other improvements which may be impaired during construction operations. It shall be the CONTRACTOR's responsibility to ascertain the actual location of all existing utilities and other improvements that will be encountered in its construction operations, and to see that such utilities or other improvements are adequately protected from damage due to such operations.

The CONTRACTOR shall take all possible precautions for the protection of unforeseen utility lines to provide for uninterrupted service and to provide such special protection as may be necessary.

- B. Utilities to be Moved: In case it shall be necessary to move the property of any public utility or franchise holder, such utility company or franchise holder will, upon request of the CONTRACTOR, be notified by the OWNER to move such property within a specified reasonable time.

When utility lines that are to be removed are encountered within the area of operations, the CONTRACTOR shall notify the RESIDENT ENGINEER a sufficient time in advance for the necessary measures to be taken to prevent interruption of service.

- C. Where the proper completion of the WORK requires the temporary or permanent removal and/or relocation of an existing utility or other improvement which is indicated, the CONTRACTOR shall remove and, without unnecessary delay, temporarily replace or relocate such utility or improvement in a manner satisfactory to the RESIDENT ENGINEER and the owner of the facility.

In all cases of such temporary removal or relocation, restoration to former location shall be accomplished by the CONTRACTOR in a manner that will restore or replace the utility or improvement as nearly as possible to its former locations and to as good or better condition than found prior to removal.

- D. OWNER's Right of Access: The right is reserved to the OWNER and to the owners of public utilities and franchises to enter at any time upon any public street, alley, right-of-way, or easement for the purpose of making changes in their property made necessary by the WORK of this Contract.
- E. Underground Utilities Indicated: Existing utility lines that are indicated or the locations of which are made known to the CONTRACTOR prior to excavation and that are to be retained, and all utility lines that are constructed during excavation operations shall be protected from damage during excavation and backfilling and, if damaged, shall be immediately repaired or replaced by the CONTRACTOR. CONTRACTOR is responsible for all costs associated with supporting existing utilities across trenches or excavations.
- F. Underground Utilities Not Indicated: In the event that the CONTRACTOR damages any existing utility lines that are not indicated or the locations of which are not made known to the CONTRACTOR prior to excavation, a written report thereof shall be made immediately to the RESIDENT ENGINEER. If directed by the RESIDENT ENGINEER, repairs shall be made by the CONTRACTOR under the provisions for changes and extra work contained in accordance with the provisions of this contract.
- G. All costs of locating, repairing damage not due to failure of the CONTRACTOR to exercise reasonable care, and removing or relocating such utility facilities not shown in the Contract Documents with reasonable accuracy, and for equipment on the project which was actually working on that portion of the work which was interrupted or idled by removal or relocation of such utility facilities, and which was necessarily idled during such work will be paid for as extra work in accordance with the provisions of this contract.
- H. Approval of Repairs: All repairs to a damaged utility or improvement are subject to inspection and approval by an authorized representative of the utility or improvement owner before being concealed by backfill or other work.
- I. Maintaining in Service: All oil and gasoline pipelines, power, and telephone or the communication cable ducts, gas and water mains, irrigation lines, sewer lines, storm drain lines, poles, and overhead power and communication wires and cables encountered along the line of the WORK shall remain continuously in service during all the operations under the Contract, unless other arrangements satisfactory to the RESIDENT ENGINEER are made with the owner of said pipelines, duct, main, irrigation line, sewer, storm drain, pole, or wire or cable. The CONTRACTOR shall be responsible for and shall repair all damage due to its operations, and the provisions of this Section shall not be abated even in the event such damage occurs after backfilling or is not discovered until after completion of the backfilling.

1.6 TREES WITHIN STREET RIGHTS-OF-WAY AND PROJECT LIMITS

- A. General: The CONTRACTOR shall exercise all necessary precautions so as not to damage or destroy any trees or shrubs, including those lying within street rights-of-way and project limits, and shall not trim or remove any trees unless such trees have been approved for trimming or removal by the jurisdictional agency or OWNER. All existing trees and shrubs which are damaged during construction shall be trimmed or replaced by the CONTRACTOR or a certified tree company under permit from the jurisdictional agency and/or the OWNER. Tree trimming and replacement shall be accomplished in accordance with the following paragraphs.
- B. Trimming: Symmetry of the tree shall be preserved; no stubs or splits or torn branches left; clean cuts shall be made close to the trunk or large branch. Spikes shall not be used for climbing live trees. All cuts over 1-1/2 inches in diameter shall be coated with an asphaltic emulsion material.
- C. Replacement: The CONTRACTOR shall immediately notify the jurisdictional agency and/or the OWNER if any tree is damaged by the CONTRACTOR's operations. If, in the opinion of said agency or the OWNER, the damage is such that replacement is necessary, the CONTRACTOR shall replace the tree at its own expense. The tree shall be of a like size and variety as the tree damaged, or, if of a smaller size, the CONTRACTOR shall pay to the owner of said tree a compensatory payment acceptable to the tree owner, subject to the approval of the jurisdictional agency or OWNER. The size of the trees shall be not less than 1-inch diameter nor less than 6 feet in height.

1.7 NOTIFICATION BY THE CONTRACTOR

- A. Prior to any excavation in the vicinity of any existing underground facilities, including all water, sewer, storm drain, gas, petroleum products, or other pipelines; all buried electric power, communications, or television cables; all traffic signal and street lighting facilities; and all roadway and state highway rights-of-way the CONTRACTOR shall notify the respective authorities representing the owners or agencies responsible for such facilities not less than 3 days nor more than 7 days prior to excavation so that a representative of said owners or agencies can be present during such work, if they so desire. The CONTRACTOR shall also notify the regional notification center at 811 at least 2 days, but no more than 14 days, prior to such excavation.

PART 2 -- PRODUCTS (Not Used)

PART 3 -- EXECUTION (Not Used)

**** END OF SECTION ****

**SECTION 01 55 00
SITE ACCESS AND STORAGE**

PART 1 - GENERAL

1.1 HIGHWAY/ROADWAY LIMITATIONS

- A. The CONTRACTOR shall make its own investigation of the condition of available public and private roads and of clearances, restrictions, bridge load limits, and other limitations affecting transportation and ingress and egress to the site of the WORK. If needed, it shall be the CONTRACTOR's responsibility to construct and maintain any haul roads required for its construction operations.

1.2 TEMPORARY CROSSINGS

- A. General: Continuous, unobstructed, safe, and adequate pedestrian and vehicular access shall be provided to fire hydrants, commercial and industrial establishments, churches, schools, parking lots, service stations, motels, fire and police stations, and hospitals. Safe and adequate public transportation stops and pedestrian crossings at intervals not exceeding 300 feet shall be provided.

The CONTRACTOR shall cooperate with parties involved in the delivery of mail and removal of trash and garbage so as to maintain existing schedules for such services. Vehicular access to residential driveways shall be maintained to the property line except when necessary construction precludes such access for reasonable periods of time.

The CONTRACTOR shall be responsible to notify all residents, businesses and affected City Departments which will be affected by the WORK. Printed notices, which include the dates and hours of work, shall be distributed to affected parties at least one week prior to starting the WORK.

- B. Temporary Bridges: Wherever necessary, the CONTRACTOR shall provide suitable temporary bridges or steel plates over unfilled excavations, except in such cases as the CONTRACTOR shall secure the written consent of the individuals or authorities concerned to omit such temporary bridges or steel plates, which written consent shall be delivered to the RESIDENT ENGINEER prior to excavation.

All such bridges or steel plates shall be maintained in service until access is provided across the backfilled excavation. Temporary bridges or steel plates for street and highway crossing shall conform to the requirements of the authority having jurisdiction in each case, and the CONTRACTOR shall adopt designs furnished by said authority for such bridges or steel plates, or shall submit design to said authority for approval, as may be required.

- C. Street Use: Nothing herein shall be construed to entitle the CONTRACTOR to the exclusive use of any public street, alleyway, or parking area during the performance of the WORK hereunder, and it shall so conduct its operations as not to interfere unnecessarily with the authorized work of utility companies or other agencies in such streets, alleyways, or parking areas.

No street shall be closed to the public without first obtaining permission of the RESIDENT ENGINEER and proper governmental authority. Where excavation is being performed in primary streets or highways, one lane in each direction shall be kept open to traffic at all times unless otherwise indicated. Toe boards shall be

provided to retain excavated material if required by the RESIDENT ENGINEER or the agency having jurisdiction over the street or highway.

Fire hydrants on or adjacent to the WORK shall be kept accessible to fire-fighting equipment at all times.

Temporary provisions shall be made by the CONTRACTOR to assure the use of sidewalks and the proper functioning of all gutters, storm drain inlets, and other drainage facilities.

1.3 TEMPORARY TRAFFIC CONTROL

- A. Temporary Traffic Control measures shall comply with the requirements of the 2015 Greenbook and 2015 Whitebook. Part 6 of the 2015 Whitebook pertains to Temporary Traffic Control.

1.4 CONTRACTOR'S WORK AND STORAGE AREA

- A. The OWNER will designate and arrange for the CONTRACTOR's use, a portion of the property adjacent to the WORK for its exclusive use during the term of the Contract as a storage and shop area for its construction operations relative to this contract.
- B. Lands to be furnished by the OWNER for construction staging, construction operation, and other purposes are indicated on the plans. Should the CONTRACTOR find it necessary to use any additional land for its camp or for other purposes during the construction of the WORK, it shall provide for the use of such lands at its own expense.
- C. Construction staging areas shall be enclosed by chain-link fencing with full-coverage, dark green colored screening.

1.5 PARKING

- A. The CONTRACTOR shall:
 - 1. Provide temporary parking areas as follows:
 - Two (2) spaces for the RESIDENT ENGINEER & Other City Staff (as may need to come to the site)
 - One (1) space designated for the handicapped
 - 2. When space on the site is not available, the CONTRACTOR shall make 1 additional space available for the OWNER's use.
 - 3. The CONTRACTOR shall direct its employees to park in areas as directed by the RESIDENT ENGINEER.
 - 4. Traffic and parking areas shall be maintained in a sound condition, free of excavated material, construction equipment, mud, and construction materials. The CONTRACTOR shall repair breaks, potholes, low areas which collect standing water, and other deficiencies.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

**** END OF SECTION ****

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**SECTION 01 56 00
TEMPORARY ENVIRONMENTAL CONTROLS**

PART 1 -- GENERAL

1.1 EXPLOSIVES AND BLASTING

- A. The use of explosives on the WORK will not be permitted.

1.2 DUST ABATEMENT

- A. The CONTRACTOR shall furnish all labor, equipment, and means required and shall carry out effective measures wherever and as often as necessary to prevent its operation from producing dust in amounts damaging to property, cultivated vegetation, or domestic animals, or causing a nuisance to persons living in or occupying buildings in the vicinity. The CONTRACTOR shall be responsible for any damage resulting from any dust originating from its operations. The dust abatement measures shall be continued until the CONTRACTOR is relieved of further responsibility by the RESIDENT ENGINEER.

1.3 RUBBISH CONTROL

- A. During the progress of the WORK, the CONTRACTOR shall keep the site of the WORK and other areas used by it in a neat and clean condition, and free from any accumulation of rubbish. The CONTRACTOR shall dispose of all rubbish and waste materials of any nature occurring at the WORK site, and shall establish regular intervals of collection and disposal of such materials and waste. The CONTRACTOR shall also keep its haul roads free from dirt, rubbish, and unnecessary obstructions resulting from its operations. Disposal of all rubbish and surplus materials shall be off the site of construction in accordance with local codes and ordinances governing locations and methods of disposal, and in conformance with all applicable safety laws, and to the particular requirements of Part 1926 of the OSHA Safety and Health Standards for Construction.

1.4 SANITATION

- A. Toilet Facilities: Fixed or portable chemical toilets shall be provided wherever needed for the use of employees. Toilets at construction job sites shall conform to the requirements of Part 1926 of the OSHA Standards for Construction.
- B. Sanitary and Other Organic Wastes: The CONTRACTOR shall establish a regular daily collection of all sanitary and organic wastes. All wastes and refuse from sanitary facilities provided by the CONTRACTOR or organic material wastes from any other source related to the CONTRACTOR's operations shall be disposed of away from the site in a manner satisfactory to the RESIDENT ENGINEER and in accordance with all laws and regulations pertaining thereto.

1.5 SEWAGE BYPASS AND PUMPING

- A. Sewage bypassing and pumping shall be per Greenbook/Whitebook Section 7-8.5.2 Sewage Bypass and Pumping Plan.

1.6 CHEMICALS

- A. All chemicals used during project construction or furnished for project operation, whether defoliant, soil sterilant, herbicide, pesticide, disinfectant, polymer, reactant or of other classification, shall show approval of either the U.S. Environmental Protection Agency or the U.S. Department of Agriculture. Use of all such chemicals and disposal of residues shall be in strict accordance with the printed instructions of the manufacturer. In addition, see the requirements set forth in accordance with the provisions of this contract.

1.7 CULTURAL RESOURCES

- A. The CONTRACTOR's attention is directed to the National Historic Preservation Act of 1966 (16 U.S.C. 470) and 36 CFR 800 which provides for the preservation of potential historical architectural, archaeological, or cultural resources (hereinafter called "cultural resources").
- B. The CONTRACTOR shall conform to the applicable requirements of the National Historic Preservation Act of 1966 as it relates to the preservation of cultural resources.
- C. In the event potential cultural resources are discovered during subsurface excavations at the site of construction, the following procedures shall be instituted:
 - 1. The RESIDENT ENGINEER will issue a Field Order directing the CONTRACTOR to cease all construction operations at the location of such potential cultural resources find.
 - 2. Such Field Order shall be effective until such time as a qualified archaeologist can be called to assess the value of these potential cultural resources and make recommendations to the State Water Resources Control Board Cultural Resources Officer.
- D. If the archaeologist determines that the potential find is a bona fide cultural resource, at the direction of the State Water Resources Control Board Cultural Resources Officer, the CONTRACTOR shall suspend work at the location of the find under the provisions for changes contained in accordance with the provisions of this contract.

PART 2 -- PRODUCTS (Not Used)

PART 3 -- EXECUTION (Not Used)

**** END OF SECTION ****

**SECTION 01 57 00
TRAFFIC REGULATION**

PART 1 - GENERAL

1.1 GUIDANCE

- A. The CONTRACTOR shall comply with the guidance provided by the Local Authorities, the State Department of Transportation, Plans and Specification Requirements, Permit Restrictions, and any other Governing Source, when regulating traffic on public roads.

1.2 CONSTRUCTION PARKING CONTROL

- A. Control vehicular parking to prevent interference with public traffic and parking, access by emergency vehicles, and OWNER'S operations.
- B. Monitor parking of construction personnel's vehicles. No personal vehicles will be permitted beyond the designated construction parking area. Maintain vehicular access to and through parking areas.
- C. Prevent parking on or adjacent to access roads or in non-designated areas.

1.3 TRAFFIC CONTROL PERMITS

- A. The CONTRACTOR is responsible for paying all fees and doing the necessary work for obtaining all traffic control permits for the project. Coordinate the traffic control permit application submittal with the Work so that no items of Work will be delayed. To obtain a temporary traffic control permit, call the Construction Management and Field Services Division (CMFS - previously Field Engineering) Traffic Control Section, (858) 495-4741 for an appointment a minimum of 2 Working Days prior to starting the Work (5 Working Days when the Work will affect a traffic signal). Provide 1 copy of the temporary traffic control drawings specified in the Contract Documents at the time of the appointment. Upon approval of your plans, the Traffic Control Section of the CMFS Division will issue the permit.

PART 2 - PRODUCTS

2.1 SIGNS, SIGNALS, AND DEVICES

- A. Traffic Control Signals: As approved by local jurisdictions.
- B. Traffic Cones and Drums, Flares and Lights: As approved by local jurisdictions.
- C. Flagman Equipment: As required by local jurisdictions.

PART 3 - EXECUTION

3.1 FLAGPERSONS

- A. Provide trained and equipped flag-persons to regulate traffic when construction operations or traffic encroach on public traffic lanes.

3.2 FLARES AND LIGHTS

- A. Use flares and lights during hours of low visibility to delineate traffic lanes and to guide traffic.

3.3 HAUL ROUTES AND SITE ACCESS

- A. Confine construction traffic to designated haul routes.
- B. Provide traffic control at critical areas of haul routes to regulate traffic and to minimize interference with public traffic.

3.4 TRAFFIC SIGNS AND SIGNALS

- A. Install traffic signs and operate traffic control signals to direct and maintain orderly flow of traffic in areas under CONTRACTOR'S control, and areas affected by CONTRACTOR'S operations.
- B. Relocate as the WORK progresses to maintain effective traffic control.

3.5 REMOVAL

- A. Remove equipment and devices when no longer required.
- B. Repair damage caused by installation.
- C. Remove post settings.

**** END OF SECTION ****

**SECTION 01 58 00
PROJECT SIGN**

PART 1 -- GENERAL

1.1 GENERAL

- A. The CONTRACTOR shall install and maintain at the site a project identification sign furnished by the OWNER.
- B. The OWNER will obtain a sign permit, if one is required, at no cost to the CONTRACTOR.

PART 2 -- PRODUCTS (Not Used)

PART 3 -- EXECUTION

3.1 GENERAL

- A. The CONTRACTOR shall pick up the sign from the General Services Sign Shop (located at 2781 Caminito Chollas, San Diego) and transport it to the site.

3.2 INSTALLATION

- A. The CONTRACTOR shall mount the sign in a manner and at a location at the site accepted by the RESIDENT ENGINEER.

3.3 REMOVAL

- A. The CONTRACTOR shall remove the project identification sign and return it to the sign shop upon preparation of the Notice of Completion by the RESIDENT ENGINEER.

** END OF SECTION **

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**SECTION 01 60 00
PRODUCTS, MATERIALS, EQUIPMENT AND SUBSTITUTIONS**

PART 1 -- GENERAL

1.1 DEFINITIONS

- A. The word "Products," as used herein, is defined to include purchased items for incorporation into the WORK, regardless of whether specifically purchased for the project or taken from CONTRACTOR's stock of previously purchased products. The word "Materials," is defined as products which must be substantially cut, shaped, worked, mixed, finished, refined, or otherwise fabricated, processed, installed, or applied to form units of work. The word "Equipment" is defined as products with operational parts, regardless of whether motorized or manually operated, and particularly including products with service connections (wiring, piping, and other like items). Definitions in this paragraph are not intended to negate the meaning of other terms used in the Contract Documents, including "specialties," "systems," "structure," "finishes," "accessories," "furnishings," special construction," and similar terms, which are self-explanatory and have recognized meanings in the construction industry.
- B. Neither "Products" nor "Materials" nor "Equipment" includes machinery and equipment used for preparation, fabrication, conveying and erection of the WORK.

1.2 QUALITY ASSURANCE

- A. Source Limitations: To the greatest extent possible for each unit of work, the CONTRACTOR shall provide products, materials, and equipment of a singular generic kind from a single source.
- B. Compatibility of Options: Where more than one choice is available as options for CONTRACTOR's selection of a product, material, or equipment, the CONTRACTOR shall select an option which is compatible with other products, materials, or equipment. Compatibility is a basic general requirement of product, material and equipment selections.

1.3 PRODUCT DELIVERY AND STORAGE

- A. The CONTRACTOR shall deliver and store the WORK in accordance with manufacturer's written recommendations and by methods and means which will prevent damage, deterioration, and loss including theft. Delivery schedules shall be controlled to minimize long-term storage of products at site and overcrowding of construction spaces. In particular, the CONTRACTOR shall ensure coordination to ensure minimum holding or storage times for flammable, hazardous, easily damaged, or sensitive materials to deterioration, theft, and other sources of loss. Materials delivered onsite without an approved submittal for verification shall be rejected and payment withheld.

1.4 TRANSPORTATION AND HANDLING

- A. Products shall be transported by methods to avoid damage and shall be delivered in undamaged condition in manufacturer's unopened containers and packaging.

- B. The CONTRACTOR shall provide equipment and personnel to handle products, materials, and equipment by methods to prevent soiling and damage.
- C. The CONTRACTOR shall provide additional protection during handling to prevent marring and otherwise damaging products, packaging, and surrounding surfaces.

1.5 STORAGE AND PROTECTION

- A. Products shall be stored in accordance with manufacturer's written instructions and with seals and labels intact and legible. Sensitive products shall be stored in weather-tight climate controlled enclosures and temperature and humidity ranges shall be maintained within tolerances required by manufacturer's recommendations.
- B. For exterior storage of fabricated products, products shall be placed on sloped supports above ground. Products subject to deterioration shall be covered with impervious sheet covering and ventilation shall be provided to avoid condensation.
- C. Loose granular materials shall be stored on solid flat surfaces in a well-drained area and shall be prevented from mixing with foreign matter.
- D. Storage shall be arranged to provide access for inspection. The CONTRACTOR shall periodically inspect to assure products are undamaged and are maintained under required conditions.
- E. Storage shall be arranged in a manner to provide access for maintenance of stored items and for inspection.

1.6 MAINTENANCE OF STORAGE

- A. Stored products shall be periodically inspected on a scheduled basis. The CONTRACTOR shall maintain a log of inspections and shall make the log available on request.
- B. The CONTRACTOR shall comply with manufacturer's product storage requirements and recommendations.
- C. The CONTRACTOR shall maintain manufacturer-required environmental conditions continually.
- D. The CONTRACTOR shall ensure that surfaces of products exposed to the elements are not adversely affected and that weathering of finishes does not occur.
- E. For mechanical and electrical equipment, the CONTRACTOR shall provide a copy of the manufacturer's service instructions with each item and the exterior of the package shall contain notice that instructions are included.
- F. Products shall be serviced on a regularly scheduled basis, and a log of services shall be maintained and submitted as a record document prior to acceptance by the OWNER in accordance with the Contract Documents.

1.7 INVESTIGATION OF FAILED PRODUCTS

- A. Prior to disposal of failed products, materials, or equipment, the CONTRACTOR shall inform and report the causes of failure during or after construction to the RESIDENT ENGINEER.

1.8 PROPOSED SUBSTITUTES OR "OR EQUAL" ITEMS

- A. Whenever materials or equipment are indicated in the Contract Documents by using the name of a proprietary item or the name of a particular Supplier and/or Manufacturer, the naming of the item is intended to establish the type, function, and quality required. Unless expressly prohibited, materials or equipment of other suppliers and/or manufacturers MAY BE accepted if SUFFICIENT information is submitted by the CONTRACTOR to the RESIDENT ENGINEER for the OWNER'S EXCLUSIVE review to determine that the material or equipment proposed is equivalent or equal to that named, subject to the following requirements:

1. The burden of proof as to the type, function, and quality of any such substitute product, material or equipment shall be upon the CONTRACTOR.
2. The OWNER will be the sole judge as to the type, function, and quality of any such substitute and the OWNER's decision shall be final.
3. The OWNER may require the CONTRACTOR to furnish at the CONTRACTOR'S expense additional data about the proposed substitute.
4. The OWNER may require the CONTRACTOR to furnish at the CONTRACTOR'S expense a special performance guarantee, or other surety, with respect to any substitute.
5. Acceptance by the OWNER of a substitute item proposed by the CONTRACTOR shall not relieve the CONTRACTOR of the responsibility for full compliance with the Contract Documents and for adequacy of the substitute.
6. The CONTRACTOR shall be responsible for resultant changes including design and construction changes and any and all additional costs resulting from the changes which the accepted substitution requires in the CONTRACTOR'S WORK, the WORK of its subcontractors, vendors, and of other contractors, and shall effect such changes without cost to the OWNER.

- B. The procedure for review by the OWNER will include the following:

1. If the CONTRACTOR wishes to provide a substitute item, the CONTRACTOR shall make written application to the RESIDENT ENGINEER on the "Substitution Request Form." This form will be provided by the OWNER.
2. The "Substitution Request Form(s)" shall be submitted within the stipulated period PRIOR to the award of the Contract. For convenience, the requirements of Greenbook Section 4-1.6 (as amended by the City Supplement to that document) are listed below:

*Item 11: You shall submit your list of proposed substitutions for an "equal" item no less than 15 working days prior to the Bid due date/no later than 5 working days after the determination of the Apparent Low Bidder and on the City's Product Submittal Form that is available at:
<http://www.sandiego.gov/publicworks/edocref/index.shtml>.*

3. Wherever a proposed substitute item has not been submitted within said period, or wherever the submission of a proposed substitute material or equipment has been judged to be unacceptable by the OWNER, the CONTRACTOR shall provide the material or equipment indicated in the Contract Documents.
 4. The CONTRACTOR shall CERTIFY that the proposed substitute will perform adequately the functions and achieve the results called for by the general design, and be similar and of equal substance to that indicated, and be suited to the same use as that specified.
 5. The OWNER will evaluate each proposed substitute within a reasonable period of time.
 6. As applicable, no shop drawing submittals shall be made for a substitute item nor shall any substitute item be ordered, installed, or utilized without the OWNER'S prior written acceptance of the CONTRACTOR'S "Substitution Request Form."
 7. The RESIDENT ENGINEER will record the time required by the OWNER in evaluating substitutions proposed by the CONTRACTOR and in making changes by the CONTRACTOR in the Contract Documents occasioned thereby. Whether or not the OWNER accepts a proposed substitute, the CONTRACTOR shall reimburse the OWNER for the charges of the OWNER and ENGINEER for evaluating each proposed substitute.
- C. The CONTRACTOR's application using the "Substitution Request Forms" shall contain the following statements and information which shall be considered by the OWNER in evaluating the proposed substitution:
1. The evaluation and acceptance of the proposed substitute will not prejudice the CONTRACTOR's achievement of substantial completion on time.
 2. Whether or not acceptance of the substitute for use in the WORK will require a change in any of the Contract Documents to adopt the design to the proposed substitute.
 3. Whether or not incorporation or use of the substitute in connection with the WORK is subject to payment of any license fee or royalty.
 4. All variations of the proposed substitute from the items originally specified will be identified.
 5. Available maintenance, repair, and replacement service will be indicated. The manufacturer shall have a local service agency (within 50 miles of the site) which maintains properly trained personnel and adequate spare parts and is able to respond and complete repairs within 24 hours.

6. Itemized, detailed estimate of ALL costs that will result directly or indirectly from acceptance of such substitute, including cost of redesign and claims of other contractors affected by the resulting change. Please make sure to consider article 1.8 A, 1 through 6, shown above.

PART 2 -- PRODUCTS (Not Used)

PART 3 -- EXECUTION (Not Used)

**** END OF SECTION ****

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**SECTION 01 66 00
EQUIPMENT TESTING AND PLANT STARTUP**

PART 1 -- GENERAL

1.1 GENERAL

- A. Equipment testing and plant/pump station/force main startup are requisite to satisfactory completion of the contract and, therefore, shall be completed within the contract time.

1.2 EQUIPMENT TESTING

- A. The CONTRACTOR shall provide the services of an experienced and authorized representative of the manufacturer of each item of equipment indicated in the equipment schedules (excluding manually-operated valves smaller than 24 inches in size, injectors, tanks, batch-type disc meters, and rotameters, and any other minor items of equipment specifically exempted by the RESIDENT ENGINEER in writing), who shall visit the site of the WORK and inspect, check, adjust if necessary, and approve the equipment installation. In each case, the CONTRACTOR shall arrange to have the manufacturer's representative revisit the job site as often as necessary until any and all trouble is corrected and the equipment installation and operation are satisfactory to the RESIDENT ENGINEER and OWNER.
- B. The CONTRACTOR shall require that each manufacturer's representative furnish to the RESIDENT ENGINEER a written report addressed to the OWNER certifying that the equipment has been properly installed and lubricated, is in accurate alignment, is free from any undue stress imposed by connecting piping or anchor bolts, and has been operated satisfactorily under full-load conditions.
- C. The CONTRACTOR shall be responsible for scheduling all operations testing. The CONTRACTOR is advised that the RESIDENT ENGINEER and the OWNER's operating personnel will witness operations testing and that the manufacturer's representative shall be required to instruct the OWNER's operating personnel in correct operation and maintenance procedures. Such instruction shall be scheduled at a time arranged with the OWNER at least two (2) weeks in advance and shall be provided while the respective manufacturer's equipment is fully operational. On-site instruction shall be given by qualified persons who have been made familiar in advance with the equipment and systems in the plant. Prior to scheduling any operations testing, the CONTRACTOR shall have previously furnished the Owner's Manuals required under Section 01300.
- D. The CONTRACTOR shall notify the RESIDENT ENGINEER at least three (3) days in advance of each equipment test.
- E. The CONTRACTOR shall furnish all personnel, power, water, chemicals, fuel, oil, grease, and all other necessary equipment, facilities, and services required for conducting the tests.

1.3 PLANT/STATION START-UP

- A. The startup of a plant/station is a highly complex operation requiring the combined technical expertise of the CONTRACTOR, manufacturers, subcontractors, the RESIDENT ENGINEER, and the OWNER. The CONTRACTOR shall provide the effective coordination of all parties necessary for the successful plant startup. The CONTRACTOR shall also submit a resume of the Startup Expert/professional. The RESIDENT ENGINEER/OWNER will approve the Startup Expert/professional.
- B. It is not the intent of the RESIDENT ENGINEER to instruct the CONTRACTOR in the startup of the plant; however, the RESIDENT ENGINEER will be available prior to and during startup to provide technical support to the CONTRACTOR.
- C. The CONTRACTOR shall be required to start up the plant, operate it, and pass a ten (10)-day test prior to acceptance. All equipment must properly run continuously 24 hours per day for the test period at rates indicated by the RESIDENT ENGINEER. If any item malfunctions during the test, the item shall be repaired and the test restarted at day zero with no credit given for the operating time before the aforementioned malfunction.
- D. At about 50 to 70 percent completion of each station, the CONTRACTOR shall submit to the RESIDENT ENGINEER for review and approval, a detailed schedule of operations which will be necessary to effect a successful initial operation and sustained period of operation for the duration of the required startup period.
- E. The CONTRACTOR shall provide operating personnel for the duration of the startup. Additionally, the CONTRACTOR shall provide its own alternative plan for providing, at its own expense, all water, power, chemicals, and other consumables required for successful completion of the test, in the event that public utilities, facilities, and/or resources become not readily available for hookup or tapping.
- F. The startup shall not be commenced until all required leakage tests and equipment tests have been completed to the satisfaction of the RESIDENT ENGINEER/OWNER.
- G. All defects in materials or workmanship which appear during this test period shall be immediately corrected by the CONTRACTOR. Time lost for equipment repairs, wiring corrections, control point settings, or other reasons which actually interrupt the startup may, at the discretion of the RESIDENT ENGINEER, be justifiable cause for extending the startup test duration.
- H. During the startup, the CONTRACTOR shall provide the services of authorized representatives of the manufacturers, in addition to those services required under operations testing, as necessary, to correct faulty equipment operation.
- I. During the startup, the CONTRACTOR shall keep records of the operations, in accordance with the instructions of the RESIDENT ENGINEER.

PART 2 -- PRODUCTS (Not Used)

PART 3 -- EXECUTION (Not Used)

**** END OF SECTION ****

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**SECTION 01 70 00
PROJECT CLOSEOUT**

PART 1 -- GENERAL

1.1 FINAL CLEANUP

- A. The CONTRACTOR shall promptly remove from the vicinity of the completed work, all rubbish, unused materials, concrete forms, construction equipment, and temporary structures and facilities used during construction. Final acceptance of the WORK by the OWNER will be withheld until the CONTRACTOR has satisfactorily complied with the foregoing requirements for final cleanup of the project site.

1.2 CLOSE-OUT TIMETABLE

- A. The CONTRACTOR shall establish dates for equipment testing, acceptance periods, and on-site instructional periods (as required under the Contract). Such dates shall be established not less than one week prior to beginning any of the foregoing items, to allow the OWNER, the RESIDENT ENGINEER, and their authorized representatives sufficient time to schedule attendance at such activities.

1.3 OWNER'S MANUAL (OR OPERATION AND MAINTENANCE MANUAL) SUBMITTAL

- A. The CONTRACTOR's attention is directed to the condition that one percent of the contract price will be deducted from any monies due the CONTRACTOR as progress payments, if at the 75 percent construction completion point, the approved OWNER'S MANUAL complying with Section 01300 has not been submitted. The aforementioned amount will be retained by the OWNER as the agreed, estimated value of the approved OWNER'S MANUALS. Any such retention of money for failure to submit the approved OWNER'S MANUALS on or before the 75 percent construction completion point shall be in addition to the retention of any payments due to the CONTRACTOR.

1.4 FINAL SUBMITTALS

- A. The CONTRACTOR, prior to requesting final payment, shall obtain and submit the following items to the RESIDENT ENGINEER for transmittal to the OWNER:
1. Written guarantees, where required.
 2. Operations and Maintenance manuals and instructions.
 3. New permanent cylinders and key blanks for all locks.
 4. Maintenance stock items; spare parts; special tools.
 5. Completed Record Drawings and ALL Master Record Documents, to include the specifications.
 6. Bonds for roofing, maintenance, etc., as required.

7. Certificates of inspection and acceptance by local governing agencies having jurisdiction.
8. Releases from all parties who are entitled to claims against the subject project, property, or improvement pursuant to the provisions of law.

1.5 MAINTENANCE AND GUARANTEE

- A. The CONTRACTOR shall comply with the maintenance and guarantee requirements contained in the Greenbook, Whitebook, and the supplementary special provisions.
- B. Replacement of earth fill or backfill, where it has settled below the required finish elevations, shall be considered as a part of such required repair work, and any repair or resurfacing constructed by the CONTRACTOR which becomes necessary by reason of such settlement shall likewise be considered as a part of such required repair work unless the CONTRACTOR shall have obtained a statement in writing from the affected private owner or public agency releasing the OWNER from further responsibility in connection with such repair or resurfacing.
- C. The CONTRACTOR shall make all repairs and replacements promptly upon receipt of written order from the OWNER. If the CONTRACTOR fails to make such repairs or replacements promptly, the OWNER reserves the right to do the WORK and the CONTRACTOR and his surety shall be liable to the OWNER for the cost thereof.

1.6 BOND

- A. The CONTRACTOR shall provide a bond to guarantee performance of the provisions contained in Paragraph "Maintenance and Guarantee" above, and the Greenbook/Whitebook, and the supplementary special provisions.

PART 2 -- PRODUCTS (Not Used)

PART 3 -- EXECUTION (Not Used)

**** END OF SECTION ****

**SECTION 01 99 90
REFERENCE FORMS**

PART 1 -- GENERAL

1.1 GENERAL

- A. If required by the RESIDENT ENGINEER, the forms listed below and included in this section will be used as applicable. Submit forms to RESIDENT ENGINEER within 7 calendar days of completion.

<u>Form No.</u>	<u>Title</u>
1	Submittal Transmittal Form
2	Equipment Test Report Form
3	Operation and Maintenance Transmittal Form
4	Equipment Record Form
5	Equipment Record Form
6	Manufacturer's Installation Certification Form
7	Manufacturer's Instruction Certification Form

FORM #1: SUBMITTAL TRANSMITTAL FORM:

SUBMITTAL TRANSMITTAL

Submittal Description: _____ Submittal No.:1 _____

Spec Section: _____

	Routing	Sent	Received
OWNER:	Contractor/CM		
PROJECT:	CM/Engineer		
	Engineer/CM		
CONTRACTOR:	CM/Contractor		

We are sending you Attached Under separate cover via
 Submittals for review and comment
 Product data for information only

Remarks: _____

Item	Copies	Date	Section No.	Description	Review action ^a	Reviewer initials	Review comments attached

^aNOTE: NET = No exceptions taken; MCN = Make corrections noted; A&R = Amend and resubmit; R = Rejected; AAN = Approved as Noted
 Attach additional sheets if necessary

Contractor

Certify either A or B:

- A. We have verified that the material or equipment contained in this submittal meets all the requirements, including coordination with all related work, specified (no exceptions).
- B. We have verified that the material or equipment contained in this submittal meets all the requirements specified except for the attached deviations.

<u>No.</u>	<u>Deviation</u>

Certified by: _____

Contractor's Signature

¹Follow RESIDENT ENGINEER's direction for how to number each submittal (and re-submittals).

NOTE: This example equipment test report is provided for the benefit of the Contractor and is not specific to any piece of equipment to be installed as a part of this project. The example is furnished as a means of illustrating the level of detail required for the preparation of equipment test report forms for this project.

CITY OF SAMPLE

**EXAMPLE WATER TREATMENT PLANT
STAGE IV EXPANSION PROJECT**

ABC Construction Company, Inc., General Contractor
XYZ Engineering, Inc., RESIDENT ENGINEER

EQUIPMENT TEST REPORT

Equipment Name: Sludge Pump 2
 Equipment Number: P25202
 Specification Ref: 11390
 Location: East Sedimentation Basin Gallery

		Contractor		RESIDENT ENGINEER	
		Verified	Date	Verified	Date

PREOPERATIONAL CHECKLIST

Mechanical

Lubrication	_____	_____	_____	_____
Alignment	_____	_____	_____	_____
Anchor bolts	_____	_____	_____	_____
Seal water system operational	_____	_____	_____	_____
Equipment rotates freely	_____	_____	_____	_____
Safety guards	_____	_____	_____	_____
Valves operational	_____	_____	_____	_____
Hopper purge systems operational	_____	_____	_____	_____
Sedimentation tank/hopper clean	_____	_____	_____	_____
O&M manual information complete	_____	_____	_____	_____

	Contractor		RESIDENT ENGINEER	
	Verified	Date	Verified	Date
<u>Electrical</u> (circuit ring-out and high pot tests)				
Circuits:				
Power to MCC 5	_____	_____	_____	_____
Control to HOA	_____	_____	_____	_____
Indicators at MCC:				
Red (running)	_____	_____	_____	_____
Green (power)	_____	_____	_____	_____
Amber (auto)	_____	_____	_____	_____
Indicators at local control panel	_____	_____	_____	_____
Wiring labels complete	_____	_____	_____	_____
Nameplates:				
MCC	_____	_____	_____	_____
Control station	_____	_____	_____	_____
Control panel	_____	_____	_____	_____
Equipment bumped for rotation	_____	_____	_____	_____
<u>Piping Systems</u>				
Cleaned and flushed:				
Suction	_____	_____	_____	_____
Discharge	_____	_____	_____	_____
Pressure tests	_____	_____	_____	_____
Temporary piping screens in place	_____	_____	_____	_____
<u>Instrumentation and Controls</u>				
Flow meter FE2502F calibration	_____	_____	_____	_____
Calibration Report No. _____				
Flow recorder FR2502G calibrated	_____	_____	_____	_____
against transmitter	_____	_____	_____	_____
VFD speed indicator calibrated against	_____	_____	_____	_____
independent reference	_____	_____	_____	_____
Discharge overpressure shutdown	_____	_____	_____	_____
switch calibration	_____	_____	_____	_____
Simulate discharge overpressure	_____	_____	_____	_____
Shutdown	_____	_____	_____	_____

	Contractor		RESIDENT ENGINEER	
	Verified	Date	Verified	Date
FUNCTIONAL TESTS				
<u>Mechanical</u>				
Motor operation temperature satisfactory	_____	_____	_____	_____
Pump operating temperature satisfactory	_____	_____	_____	_____
Unusual noise, etc.?	_____	_____	_____	_____
Pump operation: 75 gpm/50 psig Measurement:	_____	_____	_____	_____
	Flow	_____	Test	_____
	Pressure	_____	Gauge#	_____
Alignment hot	_____	_____	_____	_____
Dowelled in	_____	_____	_____	_____
Remarks:	_____			

Electrical

Local switch function:

Runs in *HAND*

No control power in *OFF*

Timer control in *AUTO*

Overpressure protection switch PS2502C functional in both *HAND* and *AUTO*

Overpressure protection switch

PS2502C set at 75 psig

PLC 2500 set at 24-hour cycle, 25 min *ON*

OPERATIONAL TEST

Forty-eight hour continuous test. Pump cycles as specified, indicators functional, controls functional, pump maintains capacity, overpressure protection remains functional, hour meter functional.

RECOMMENDED FOR BENEFICIAL OCCUPANCY

RESIDENT ENGINEER _____ Date _____

ACCEPTED FOR BENEFICIAL OCCUPANCY

Owner's Representative _____ Date _____

FORM #3: OPERATION AND MAINTENANCE TRANSMITTAL FORM:

Date _____
 : _____
 To: _____

Submittal
 No:1 _____
 Contract No: _____
 Spec.
 Section: _____

 Submittal
 Description: _____

 From: _____

Attention: _____

Checklist	Contractor		RESIDENT ENGINEER	
	Satisfactory	N/A	Accept	Deficient
1. Table of contents				
2. Equipment record forms				
3. Manufacturer information				
4. Vendor information				
5. Safety precautions				
6. Operator prestart				
7. Start-up, shutdown, and post-shutdown procedures				
8. Normal operations				
9. Emergency operations				
10. Operator service requirements				
11. Environmental conditions				
12. Lubrication data				
13. Preventive maintenance plan and schedule				
14. Troubleshooting guides and diagnostic techniques				
15. Wiring diagrams and control diagrams				

16. Maintenance and repair procedures				
17. Removal and replacement instructions				
18. Spare parts and supply list				
19. Corrective maintenance man-hours				
20. Parts identification				
21. Warranty information				
22. Personnel training requirements				
23. Testing equipment and special tool information				

Remarks:

Contractor's Signature

1 Follow RESIDENT ENGINEER's direction for how to number each submittal (and re-submittals).

FORM #4: EQUIPMENT RECORD FORM:

EQUIP DESCRIP		EQUIP LOC	
EQUIP NO.	SHOP DWG	DATE INST	COST
MFGR		MFGR CONTACT	
MFGR ADDRESS		PHONE	
VENDOR		VENDOR CONTACT	
VENDOR ADDRESS		PHONE	

MAINTENANCE REQUIREMENTS	D	W	M	Q	S	A	Hours

LUBRICANT RECOMMENDED: _____

ALTERNATIVE: _____

MISC. NOTES: _____

RECOMMENDED SPARE PARTS			
PART NO.	QUA	PAR	COST

ELECTRICAL NAMEPLATE DATA			
EQUIP			
MAKE			
SERIAL NO.		ID NO.	
MODEL NO.		FRAME NO.	
HP	V	AMP	HZ
PH	RPM	SF	DUTY
CODE	INSL.	DES	TYPE
NEMA DESC	AMB	TEMP	RATING
MECHANICAL NAMEPLATE DATA			
EQUIP			
MAKE			
SERIAL NO.		ID NO.	
MODEL NO.		FRAME NO.	
HP	RPM	CAP	SIZE
TDH	IMP	BELT NO.	CFM
PSI	ASSY	CASE NO.	
MISC			

FORM #6: MANUFACTURER'S INSTALLATION CERTIFICATION FORM:

Contract No.: _____ Specification Section: _____

Equipment Name: _____

Contractor
: _____

Manufacturer of equipment item: _____

The undersigned manufacturer of the equipment item described above hereby certifies that he has checked the installation of the equipment and that the equipment, as specified in the project manual, has been provided in accordance with the manufacturer's recommendations, and that the trial operation of the equipment item has been satisfactory.

Comments: _____

Date

Manufacturer

Signature of Authorized Representative

Date

Contractor

Signature of Authorized Representative

FORM #7: MANUFACTURER'S INSTRUCTION CERTIFICATION FORM:

Contract No.: _____ Specification Section: _____
 Equipment Name: _____
 Contractor _____
 : _____
 Manufacturer of equipment item: _____

The undersigned manufacturer certifies that a service engineer has instructed the wastewater treatment plant operating personnel in the proper maintenance and operation of the equipment designated herein.

Operations Check List (check appropriate spaces)

Startup procedure reviewed	_____
Shutdown procedure reviewed	_____
Normal operation procedure reviewed	_____
Others _____	_____
_____	_____
_____	_____

Maintenance Check List (check appropriate spaces)

Described normal oil changes (frequency)	_____
Described special tools required	_____
Described normal items to be reviewed for wear	_____
Described preventive maintenance instructions	_____
Described greasing frequency	_____
Others _____	_____
_____	_____
_____	_____

Date	Manufacturer
Date	Signature of Authorized Representative
Date	Signature of Owner's Representative
Date	Signature of Contractor's Representative

**** END OF SECTION ****

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**SECTION 02 41 13
SELECTIVE SITE DEMOLITION**

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Site, mechanical and electrical demolition.

1.2 RELATED WORK

- A. Section 01 30 00: Contractor Submittals
- B. Section 01 40 00: Quality Control
- C. Section 01 53 00: Protection of Existing Facilities
- D. Section 01 55 00: Site Access and Storage
- E. Section 01 60 00: Products, Materials, Equipment and Substitutions
- F. Section 02 41 14: Paving Removal and Resurfacing
- G. Section 02 41 15: Utility Line Removal and Abandonment
- H. Section 31 23 33: Trenching and Backfilling

1.3 SYSTEM DESCRIPTION

- A. Sewage Pump Station 23T improvements will generally entail removal and disposal of the following equipment (only major items are listed below):
 - 1. Sewage Pumps #1 and #2 (both are 100 hp Gorman Rupp Model T10A3S-B, skid-mounted pumping units); with all appurtenances and accessories.
 - 2. 10-inch diameter Suction Piping for Sewage Pumps #1 and #2 (except for an indicated section of that piping that penetrates the Pump Room floor). Note: a portion of this suction piping has been repaired by insertion of an 8-inch diameter PVC liner.
 - 3. 10-inch diameter Discharge Piping and valving within indicated limits.
 - 4. Removal of a 16"x8" Tee fitting (and appurtenant flanged spool) on the Discharge header; including removal of the 3" piping and abandoned Bailey control valve that is attached to the 16"x8" Tee fitting.
 - 5. Removal of 16-inch diameter yard piping within indicated limits.
 - 6. Removal of 16-inch diameter exhaust fan suction ducting within the Pump Room.
 - 7. Removal of the hoist trolley and hoist.
 - 8. Removal of certain appurtenances associated with the abandoned Nusonics ultrasonic flow meter (located within the Pump Room).
 - 9. Removal of the two Pump Room access manholes that provide wetwell access through 36-inch diameter openings in the Pump Room floor.
 - 10. Removal of the Supply Fan.
 - 11. Removal of the Exhaust Fan.
 - 12. Removal of the Sluice Gate that is at the point of discharge of the influent sewer to the pump station wetwell; including operating stem, operator, and associated appurtenances.
 - 13. Removal of the wetwell vent hood, concrete collar, and a portion of the 12" vent pipe as indicated by the contract drawings.
 - 14. Removal of the SCADA antenna.

15. Removal of electrical and control panels, lighting and other electrical appurtenances from the Pump Room, per the contract documents. Note: The existing Pump Control Panel will be re-located at grade and used as part of the modified pump station, per the contract documents.

Items not listed above shall be removed by Contractor as required by the contract documents, to accomplish the work of this contract.

- B. The following items to be removed shall be salvaged to the City:
 1. Sensor cables associated with the abandoned Nusonics ultrasonic flow meter.
 2. One ton-rated Yale Hoist and Trolley
 3. SCADA antenna
- C. Legally dispose of Items not designated for salvage.

1.4 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workmen trained and experienced in necessary trades and crafts and completely familiar with specified requirements and methods needed for proper performance of Work of this section.

1.5 REFERENCES

- A. California Building Code (CBC)
- B. California Fire Code (CFC)
- C. California Green Building Code (CGBC)
- D. California Mechanical Code (CMC)
- E. California Plumbing Code (CPC)
- F. California Electric Code (CEC)
- G. NFPA 70 National Electric Code (NEC)

1.6 PAYMENT

- A. Payment for Work in this section shall be included as part of the lump-sum for Bid Item No. 1.

PART 2 – PRODUCTS

Not Applicable

PART 3 - EXECUTION

3.1 PREPARATION

- A. Shut off or disconnect utilities affecting demolition work. Schedule shutdowns with Owner, and notify Owner 3 days in advance of any shutdown required to perform Work.

- B. Owner will open/close valves on piping and electrical disconnects required for shutdowns.

3.2 DEMOLITION

- A. Demolish items as shown on Plans.
- B. Nonstructural items not shown on Plans for demolition but interfering with (or damaged by) installation of new items, may, at Contractor's option, and pending acceptance by Owner's Representative, be temporarily demolished and replaced following installation of new items subject to the following:
 - 1. Items to be demolished may not be on a structural load path and may not include roofing, decking, trusses, beams, columns, bearing walls, shear diaphragms, connections, or foundations.
 - 2. Non-structural and non-essential items including railings, ladders, supports, piping, conduit, wiring, boxes, lighting fixtures, and other interferences may be removed and shall be replaced with new and similar material pending written permission in advance from Owner.
- C. The following demolition standards shall be followed:
 - 1. Applicable EPA, OSHA and Cal OSHA regulations
 - 2. Other applicable building, fire, plumbing, mechanical and electrical code requirements
- D. Refer variances between above documents and Contract Documents to Owner's Representative.
- E. Asbestos shall be remediated according to guidelines set up by EPA, OSHA, Cal OSHA and other regulatory agencies. Procedures shall include but not be limited to:
 - 1. Asbestos removal shall be performed by trained and registered personnel.
 - 2. Control measures may include wet methods, encapsulation, or removal with HEPA-filter-equipped vacuums into labeled polyethylene bags.
 - 3. Remove asbestos pipe in whole pipe pieces where possible. At Contractor's option, buried asbestos pipe outside any foundation footprints may be hot-tapped or snap-cut in wetted condition per Section 02 41 15. Do not sawcut asbestos.
 - 4. Air monitoring relating to asbestos removal work shall be performed by or under direct supervision of California State Certified Asbestos Consultant as required by EPA and other regulations.
- F. Following remediation, demolition shall occur as follows:
 - 1. Facilities scheduled for demolition shall be removed, salvaged and disposed of as shown in Contract Documents. Remove and dispose of all

portions of items scheduled for demolition which interfere with project construction.

2. Backfill and compact site areas disturbed by demolition work with earth or gravel backfill in accordance with Section 31 23 33.
3. Protect work not intended to be removed or salvaged. If in opinion of Owner's Representative a demolition method used may endanger or damage parts of structure or affect satisfactory operation of facilities, promptly change method upon receipt of notification from Owner's Representative.
4. No blasting will be permitted.
5. All equipment, material and piping, scheduled for demolition and not required to be salvaged to Owner shall become Contractor's property and shall be removed from project site and disposed of legally.
6. Do not reuse material salvaged from demolition work on this project except where permitted by Contract Documents.

G. Patching shall occur as follows:

1. Patching shall include restoration of surface or item to condition as near as practicable to match existing adjoining surfaces unless otherwise directed.
2. Where patching involves cleaning, painting, special coating, wall covering or other applied finish, clean and refinish entire surface plane, wall or ceiling unless complete refinishing of entire space is required elsewhere.

**** END OF SECTION ****

**SECTION 02 41 14
PAVING REMOVAL AND RESURFACING**

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Materials, testing, removal and replacement of paved surfaces disturbed by construction.
- B. The work of this section pertains to possible rehabilitation of the asphalt paving within the designated Materials and Equipment Storage area; should existing paving be damaged by Contractor.

1.2 RELATED WORK

- A. Section 01 30 00: Contractor Submittals
- B. Section 01 40 00: Quality Control
- C. Section 01 53 00: Protection of Existing Facilities
- D. Section 01 55 00: Site Access and Storage
- E. Section 01 60 00: Products, Materials, Equipment and Substitutions
- F. Section 03 30 00: Cast-in-Place Concrete
- G. Section 09 90 00: Protective Coatings
- H. Section 31 23 33: Trenching and Backfilling
- I. Section 32 12 16: Asphalt Concrete Paving

1.3 QUALITY ASSURANCE

- A. Resurfacing of existing pavement and surfaces disturbed in connection with construction of project improvements and appurtenances, shall conform to provisions of applicable permits issued by agencies having jurisdiction over work within their right-of-way.

1.4 REFERENCES

- A. Asphalt Institute MS-4 The Asphalt Handbook
- B. SSPWC Standard Specifications for Public Works Construction (Greenbook)

1.5 SUBMITTALS

- A. Furnish the following submittals.

SUBMITTAL	DESCRIPTION	
Certificate of Compliance	Submit report from testing laboratory certifying that aggregate material is asbestos-free and conforms to specified gradations or characteristics.	
Delivery Tickets	Required for all asphalt and concrete used. Deliver submittal to jobsite inspector.	

1.6 DELIVERY, STORAGE AND HANDLING

- A. Refer to contract documents for delivery, storage and handling requirements.

- B. Manufacturer's instruction and warranty requirements for delivery, storage and handling of asphalt materials shall be strictly followed.

1.7 PAYMENT

- A. Payment for Work in this section shall be included as part of the lump-sum for Bid Item No. 1.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Refer to Section 01 60 00 for basic requirements for products and materials.
- B. Removal and resurfacing products shall conform to the following specifications:

ITEM	MATERIAL	SPECIFICATION
Subgrade Preparation	Suitable material	Section 31 05 16
Base	Aggregate Base	Section 32 12 16
Prime Coat	Liquid Asphalt	Section 32 12 16
Asphalt Paving Materials	Asphalt	Section 32 12 16
Seal	Slurry Seal	Section 32 12 16

PART 3 - EXECUTION

3.1 PREPARATION

- A. Make field measurements needed to install pavement before beginning work. Make minor changes in dimensions and alignments as needed to avoid utilities or structural conflicts.
- B. Photograph and measure locations of all pavement markings to allow replacement upon completion of paving operations.

3.2 PAVEMENT REMOVAL

- A. Remove pavement or road surfacing within limits of construction excavations prior to excavation operations of any nature. Remove surplus material and dispose of as specified.
- B. Prior to removal of existing surfacing, make pavement cuts for pipelines at limits of excavations as shown or required by permit. Pavement cuts for trenches shall be neat and straight along both sides of trench and shall parallel pipe alignment to provide unfractured level pavement joints for bonding existing surfacing to new pavement replacement. Make pavement cuts for pipelines at least 12 inches outside trench face to provide benched surface of undisturbed base on which new pavement will be placed to match existing pavement.
- C. Where large irregular surfaces are removed, trim or cut paving parallel or perpendicular to roadway centerlines. Cut edges shall have clean, solid vertical faces free from loose material.

- D. For trenches 5 feet deep or less, tunnel under existing curbs, gutters, sidewalks and concrete flatwork.
- E. Cutting of concrete flatwork shall be done only by permission granted in excavation or encroachment permit.
- F. Portland cement concrete pavement, including cross gutters, curbs and gutters, sidewalks, driveways, and other concrete surfaces shall be saw cut to minimum depth of 1½ -inches prior to removal.
- G. Sawcut concrete pavement at edge of trench or excavation. Sawcut concrete curbs, gutters and sidewalks to the nearest score marks or construction joints beyond damaged portion as may be required in each case by authority having jurisdiction.
- H. Pneumatic tools may be used to cut concrete pavement only with written permission of Owner's Representative. In such event, a subsequent saw cut shall be made after backfilling, and additional concrete pavement shall be removed and disposed of by Contractor prior to resurfacing.
- I. Do not demolish Portland cement concrete using impact equipment such as stomper attachments on backhoes and excavators, wrecking balls, or other means of demolition that may result in vibration and ground shaking unless prior written consent is secured from Owner's Representative at least 3 working days before start of demolition.
- J. Asphalt concrete surfaces shall be initially cut by means of saw-cutting or other accepted equipment prior to removal of surfacing. Pavement saw-cutting will be required within rights-of-way of county roads and highways, or as required by permits or local governing bodies.
- K. Road-mixed surfaces shall be cut at limits of trench and/or excavation prior to removal of existing surfacing.

3.3 TEMPORARY PAVING

- A. Replace pavement removed by trenching operations with minimum 2 inches of temporary asphalt paving mix after compaction is accepted by Owner's Representative or within 3 days after pipe installation, whichever comes first.
- B. Place temporary pavement on cross streets and all accesses on same day that excavation is made.
- C. Maintain temporary pavement so a smooth traversable surface is available at all times for vehicular traffic, free from ruts, depressions, holes, or loose gravel.
- D. Inspect temporary paving at no greater than 12-hour intervals, 7 days per week during periods of measurable precipitation. Repair and/or replace temporary asphalt paving as needed on discovery of damage.

- E. Cost for installing, maintaining and removing temporary paving shall be included in contract unit prices for Work, and no extra compensation will be made to Contractor.

3.4 INSTALLATION

- A. Furnish and install asphalt concrete resurfacing at locations shown on Plans and Submittals and approved by Owner's Representative.
- B. The following installation standards shall be followed:
 - 1. Manufacturer's installation and warranty requirements
 - 2. Applicable OSHA and Cal OSHA regulations
 - 3. Applicable building and plumbing code requirements
 - 4. Standard Specifications for Public Works Construction
 - 5. Asphalt Institute MS-4 The Asphalt Handbook
- C. Refer variances between the above documents and Contract Documents to Owner's Representative.
- D. Installation shall proceed as follows:
 - 1. After trench is backfilled and passes compaction testing, sawcut paving to minimum depth of 1½ inches not less than 12 inches outside limits of excavation or previous pavement cut, whichever limits are greater. Remove additional surfacing and dispose of prior to resurfacing.
 - 2. Restore surface to original grade and crown section in all areas where surface is removed, broken, or damaged by equipment, or where ground has caved or settled due to the installation of the Work.
 - 3. Restore subgrades, base materials, and paved surfaces above trenches or damaged sections with subgrades, base materials and paved surfaces equal to or better than those found prior to Contractor beginning Work.
 - 4. Unless otherwise shown on Contract Documents or permits, thickness of finished asphalt concrete course shall be one inch greater than asphalt thickness prior to construction.
 - 5. Remove existing surfacing before resurfacing.
 - 6. Work shall match appearance of existing improvements.
 - 7. Where large irregular surfaces are to be resurfaced, cut and remove existing surfacing as provided herein.
 - 8. Apply asphaltic emulsion to vertical faces of all asphalt concrete pavement against which pavement replacement materials are to be placed.

9. When ready for acceptance, thoroughly compact completed surface true to grade and cross section.
 10. Lap trench section at least 12-inches on each side and hand rake so that lapped section will feather-in smoothly with existing pavement. Resulting edge of contact between new and existing pavement on each side shall parallel the existing trench and be a straight and neat join line.
- E. Portland cement resurfacing shall be installed according to requirements of the Standard Specifications for Public Works Construction. Installation shall proceed as follows:
1. Replace Portland cement concrete sidewalks, curbs, gutters and driveways to nearest scoreline or over sufficient width to replace any portions of concrete damaged, fragmented, cracked, or otherwise disturbed due to construction operations.
 2. Where new PCC pavement contacts existing PCC pavement, dowel and epoxy #4 smooth bars, 16 inches in length, spaced at 18 inches on-center, located vertically in center of the PCC pavement. Drill 8 $\frac{3}{4}$ -inch-long hole in exposed edge of existing PCC pavement just large enough to accept #4 smooth bar and epoxy bar into place in existing PCC prior to placing new concrete. Install expansion joint material as required by local governing body, agency, or association having jurisdiction over public and private streets.
 3. Construct cold joints between sections of new PCC pavement using either #4 deformed bars spaced at 18 inches on-center, located vertically in center of PCC pavement, or by forming keyway at cold joints. Thoroughly vibrate PCC into adjoining keyway during placement of each pavement section.
 4. Provide additives to concrete mix so that the color of the new (cured) concrete matches the color of the existing concrete.
- F. Minimum paving course thicknesses are shown below under field quality control.
- G. Following pavement replacement and sealing, replace all pavement markings in kind.

3.5 FIELD QUALITY CONTROL

- A. Field testing shall include the following for asphalt paving:

ITEM	TEST FOR	TEST STANDARD (ASTM OR OTHER TEST STANDARD)	FREQUENCY	FIRST TEST PAID FOR BY	RETESTS PAID FOR BY
Asphalt Concrete Paving	Minimum thickness	Thickness of section removed plus one inch	As directed	Owner	Contractor
Aggregate Base	Minimum thickness	Thickness to equal thickness of section removed and shall	As directed	Owner	Contractor

ITEM	TEST FOR	TEST STANDARD (ASTM OR OTHER TEST STANDARD)	FREQUENCY	FIRST TEST PAID FOR BY	RETESTS PAID FOR BY
		extend at least 4-inches beneath asphalt			
Finish Grade	Finish surface	No deviations from existing grade in excess of 1/8-inch in 10 feet	As directed	Owner	Contractor
		No ruts, depressions or irregularities in excess of 3/8-inch deep	As directed	Owner	Contractor
	11-month Warranty Inspection	Demonstrate compliance to Contract Documents and Permit Requirements	1 test	Owner	Contractor

B. Field testing shall include the following for Portland cement concrete paving:

ITEM	TEST FOR	TEST STANDARD (ASTM OR OTHER TEST STANDARD)	FREQUENCY	FIRST TEST PAID FOR BY	RETESTS PAID FOR BY
Portland Cement Concrete	Minimum thickness	Thickness to equal thickness of section removed (4-inch minimum)	As directed	Owner	Contractor
Aggregate Base	Minimum thickness	Thickness to equal thickness of section removed and shall extend at least 8-inches beneath PCC	As directed	Owner	Contractor
Finish Grade	Finish surface	No deviations from existing grade in excess of 1/8-inch in 10 feet	As directed	Owner	Contractor
		No ruts, depressions or irregularities in excess of 3/8-inch deep	As directed	Owner	Contractor
	11-month Warranty Inspection	Demonstrate compliance to Contract Documents and Permit Requirements	1 test	Owner	Contractor

C. Contractor shall furnish and place permanent resurfacing within 7 days after order to do so by Owner.

**** END OF SECTION ****

**SECTION 02 41 15
UTILITY LINE REMOVAL OR ABANDONMENT**

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Materials, testing, and Work required to abandon or remove existing pipes, conduit and buried structures.
- B. Work around existing asbestos-cement pipe, including snap-cutting, removal, and legal disposal.
- C. Cutting of asbestos-cement pipe shall be limited to wet snap-cutting methods and shall ensure airborne asbestos concentrations at no time exceed 0.1 fiber per cubic centimeter as averaged over 30-minute sampling period.

1.2 RELATED WORK

- A. Section 01 30 00: Contractor Submittals
- B. Section 01 40 00: Quality Control
- C. Section 01 53 00: Protection of Existing Facilities
- D. Section 01 55 00: Site Access and Storage
- E. Section 01 60 00: Products, Materials, Equipment and Substitutions
- F. Section 33 05 31: Piping Joint Materials

1.4 QUALITY ASSURANCE

- A. Use adequate number of skilled workmen trained and experienced in necessary trades and crafts and completely familiar with specified requirements and methods for proper performance of Work of this section.

1.5 REFERENCES

- A. California Building Code (CBC)
- B. California Fire Code (CFC)
- C. California Mechanical Code (CMC)
- D. California Plumbing Code (CPC)
- E. California Electric Code (CEC)
- F. NFPA 70 National Electric Code (NEC)
- G. Standard Specifications for Public Works Construction (Greenbook) Section 306-5
- H. 29 CFR 1926.1101 OSHA Construction Industry Standard for Occupational Exposure to Asbestos Subpart Z, Asbestos

1.6 PAYMENT

- A. Payment for Work in this section shall be included as part of the lump-sum for Bid Item No. 1.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Refer to Section 01 60 00 for basic requirements for products and materials.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Make field measurements needed to abandon or remove pipes, conduits, and structures and rejoin with new pipe or conduit before disturbing existing improvements.
- B. Examine areas and conditions under which Work of this section will be performed. Correct conditions detrimental to timely and proper completion of Work.
- C. Before snap cutting asbestos-cement pipe, the following items shall be on-hand:
 - 1. Snap-cutting equipment of appropriate size
 - 2. Water source and means of application sufficient to maintain continuously wetted cutting area
 - 3. Waste disposal bags
 - 4. OSHA-required safety equipment including, but not limited to disposable coveralls, full-face air-supplied respirators, rubber boots, hard hats, eye protection, and gloves.

3.2 FIELD PROCEDURES

- A. Abandon or remove pipes, conduits and structures at locations and as shown on Plans and Submittals.
- B. The following standards shall be followed:
 - 1. Applicable OSHA and Cal OSHA regulations
 - 2. Published requirements of owners of facilities to be abandoned or removed
 - 3. California Building Code
 - 4. Other applicable building, fire, plumbing, mechanical and electrical code requirements
- C. Refer variances between above documents and Contract Documents to Owner's Representative.
- D. Sewer pipelines that are to be abandoned are not required to be pumped out. However, Contractor may, at his option, empty these pipelines of sewage to the

extent he deems appropriate to facilitate his construction, and shall do so at no additional cost to Owner.

- E. Abandoned sewer pipelines will not be filled with sand, cement slurry or other material or product.
- F. Abandoned manholes shall be partially demolished and filled with sand.
- G. If Contractor determines there is a requirement to fill all of, or part of, an abandoned pipeline or structure, to facilitate construction, then with the City's prior approval and at no additional cost to Owner, 2-sack cement slurry may be furnished for that purpose.
- H. When other buried piping, conduits or structures have been or are to be abandoned and interfere with construction, remove interfering portion and securely seal open portions as follows:
 - 1. Where greater internal dimension of conduit is 48" or less, seal with one of the following methods:
 - a. a minimum 6" thick concrete wall or plug
 - b. a minimum 8" thick wall of brick and mortar
 - c. a blind flange bolted to an available existing flange
 - d. a manufactured cast-iron, ductile-iron or PVC cap
 - e. filling pipe with 2-sack slurry
 - 2. For larger openings, seal as shown on Plans.
 - 3. For catch basin connector pipes, inlet opening to mainline pipe shall also be sealed.
 - 4. Where pipes, conduits, sanitary sewers, or storm drains are to be abandoned within specified limits, abandon or remove all connected structures and appurtenances within said limits.
 - 5. Where catch basins, manholes, vaults, valves, or other structures are to be abandoned, remove upper portion to at least 48" below street subgrade. Seal conduits connecting to structure as provided herein. Perforate or break bottom of concrete or watertight structures to prevent entrapment of water. Backfill with suitable material compacted to 90%, except in layers where stricter compaction requirements are specified or shown.
 - 6. Where catch basins, manholes, vaults, valves, or other structures are to be removed, remove to full depth of structure, including foundation. Backfill with suitable material compacted to 90%, except in layers where stricter compaction requirements are specified or shown.
 - 7. Salvage cover sets, gratings, and other steel components (except reinforcing bars) of removed and abandoned structures. Contact respective owners, and, if required, deliver and load salvaged materials to owner's truck at Work site. Otherwise, such material shall become Contractor's property and shall be legally disposed of outside Work site.

- I. Snap-cutting of asbestos-cement pipe shall use cutting wheels mounted on chain wrapped around pipe. Hydraulic or manual applied pressure shall simultaneously squeeze cutting wheels into pipe wall until it severs. Snap-cutting shall proceed as follows:
 1. Excavate around asbestos-cement pipe sufficient distance to assure adequate tool clearance in area to be cut. Take care to avoid abrading or chipping pipe.
 2. Clean and wash pipe surface with water in area to be cut.
 3. Attach cutting tool around asbestos-cement pipe.
 4. Apply water to area being cut until cutting is complete.
 5. Operate cutting tool per tool manufacturer's instructions until cutting is complete, making sure to apply water in sufficient quantities to assure area being cut is continuously wet and no friable asbestos cement dust is created.
 6. Detach cutting equipment and move to next location, repeating above procedure.
 7. Upon completion of final cut, thoroughly wash cutting equipment with clean water to remove all asbestos-cement debris. Drain wash water into trench bottom. Remove washed cutting equipment from trench.
 8. Install other pipe and fittings as needed to complete Work taking care to avoid abrasion or chipping of asbestos-cement pipe.
 9. When all pipe Work is complete, thoroughly wash hands, boots, and any small tools with clean water to remove all asbestos-cement debris. Drain wash water to trench bottom.
 10. Remove disposable protective clothing, HEPA filters, tapping coupons, and other asbestos-contaminated materials, debris or containers and legally dispose of them in sealed impermeable bags or other closed impermeable containers delivered to a landfill accepting encapsulated asbestos.
 11. Exit ditch in manner that no asbestos-cement debris will contaminate clothing, boots, tools or other clothing.
 12. Backfill trench.

3.3 DISPOSAL OF REMOVED PIPE MATERIAL

- A. Dispose of removed pipe segments as unsuitable material in accordance with requirements of state and federal law.

- B. Dispose of or protect asbestos-cement utilities in accordance with OSHA Construction Industry Standard for Occupational Exposure to Asbestos Subpart Z, 29CFR 1926.1101 Asbestos.

3.4 FIELD QUALITY CONTROL

- A. Field testing shall include:

ITEM	TEST FOR	TEST STANDARD (ASTM OR OTHER TEST STANDARD)	FREQUENCY	FIRST TEST PAID FOR BY	RETESTS PAID FOR BY
Trench Backfill	Compaction	ASTM D1557	1 test	Owner	Contractor
Cement-Sand Slurry Backfill	Slump (6" maximum)	ASTM C143	1 each batch	Owner	Contractor

**** END OF SECTION ****

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**SECTION 03 10 00
CONCRETE FORMING**

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Materials, testing, erection and removal of concrete formwork including formwork, bracing, shoring, supports, falsework, and all appurtenant work.
- B. Setting of embedded bolts, anchors, pipe sleeves, conduit sleeves, conduit and similar work under direction of respective trades.

1.2 RELATED WORK

- A. Section 01 30 00: Contractor Submittals
- B. Section 01 40 00: Quality Control
- C. Section 01 53 00: Protection of Existing Facilities
- D. Section 01 55 00: Site Access and Storage
- E. Section 01 60 00: Products, Materials, Equipment and Substitutions
- F. Section 03 20 00: Concrete Reinforcing
- G. Section 03 30 00: Cast-in-Place Concrete
- H. Section 31 23 33: Trenching and Backfilling

1.3 SYSTEM DESCRIPTION

- A. Furnish and install concrete formwork including appurtenant structural, or mechanical mountings or connections required for compliance with applicable building codes and standards.
- B. Forms, shoring and falsework shall:
 - 1. Confine concrete ingredients including water, sand and cement while placing concrete,
 - 2. Confine concrete to required lines, grades and construction tolerances.
 - 3. Provide safe working environment in accordance with OSHA regulations.
 - 4. Support all dead loads and live loads plus superimposed construction loads including equipment, stored materials, personnel, impact loads from falling concrete or other materials, foundation pressures repetitive stress loads from vibrating concrete, and all other vertical and lateral loads during construction.
 - 5. Be of sufficient number and area to allow construction to proceed on schedule.
 - 6. Upon removal, leave concrete with nontoxic, clean, dry surface, free from ridges, fins, offsets, deflection marks, or similar defects. Surface shall be in

condition that can be finished by Contractor as required by Contract Documents.

- C. It shall be Contractor's responsibility to design, construct and maintain safe forms, shoring and falsework at all times in accordance with applicable OSHA regulations.
- D. If adequate foundation for shores cannot be secured, provide truss supports.
- E. Forms, shoring and falsework failing to provide all above functions shall be removed from jobsite immediately at no additional cost to Owner.
- F. Cap protruding reinforcement bars for worker protection in accordance with applicable safety codes.

1.4 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workmen trained and experienced in necessary trades and crafts and completely familiar with specified requirements and methods for proper performance of Work of this section.
- B. Design of structures shown on drawings includes no allowance for imposed construction loads. Provide forms, shoring and falsework adequate for dead loads and live loads plus imposed loads during construction.
- C. Formwork shall comply with ACI 347, except as exceeded by requirements of other regulatory agencies or as otherwise shown.
- D. Tolerances of formwork shall comply with ACI 117. Failure of finished concrete work to meet specified tolerances shall be remedied at Contractor's expense.

1.5 REFERENCES

- A. ACI 117 Standard Tolerances for Concrete Construction and Materials
- B. ACI 318 Building Code Requirements for Reinforced Concrete
- C. ACI 347 Recommended Practice for Concrete Formwork
- D. California Building Code (CBC)
- E. California Division of Occupational Health and Safety Construction Safety Orders
- F. PS1 U.S. Product Standard Code for Concrete Forms, Class 1
- G. PS20 American Softwood Lumber Standard

1.6 SUBMITTALS

- A. Furnish the following submittals.

SUBMITTAL	DESCRIPTION	
Shop Drawings	Required for construction and expansion joints placement and for sequence of forming and concrete placing operations per structural shop drawing requirements.	
	Required for falsework, formwork, and vertical shoring per structural shop drawing requirements.	
	Required for embedments, conduit, piping and other wall penetrations per structural Shop Drawing requirements.	
Catalog Data	Required for form ties, taper tie plugs (if used), form gaskets related work per catalog data requirements.	

SUBMITTAL	DESCRIPTION	
	Required for form liners. Include dimensional data and photograph of finished appearance	
Engineering Calculations	Required for falsework, formwork and vertical shoring per engineering calculations requirements. Calculations shall include statement from preparing engineer certifying falsework, formwork and vertical shoring design meets or exceeds design requirements of Cal OSHA Construction Safety Orders including Article 29 §1717, "Falsework and Vertical Shoring."	

- B. Refer to Section 01 30 00 for definition of requirements for shop drawings, catalog data, and engineering calculations.
- C. Maintain at least one copy of accepted shop drawings on site throughout concrete placing operations.

1.7 DELIVERY, STORAGE AND HANDLING

- A. Refer to contract documents for delivery, storage, and handling requirements.
- B. Manufacturer's instruction and warranty requirements for delivery, storage and handling of concrete formwork shall be strictly followed.

1.8 PAYMENT

- A. Payment for Work in this section shall be included as part of the lump-sum for Bid Item No. 1.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Acceptable Manufacturers include the following:

ITEM	MANUFACTURER	MANUFACTURER LOCATION
Form Ties	Burke Company (Penta-Tie System)	San Mateo, CA
	Dywidag Systems International	Munich, GE
	Richmond Screw Anchor Company (Snap Tys)	Fort Worth, TX
	Accepted equal	
Reusable and Wash-off Forms for Site Concrete	Labrado – wash off	
	L.M. Scofield (Lascolite) - reusable	
	Accepted equal	
Formliners	U S Formliner Div Reckli International	Bogart, GA
	Accepted equal	
Form Coatings	Grace Construction Matierials (Formfilm)	
	Sika Chemical Corporation (Antisot)	Lyndhurst, NJ
	Sonneborn Building Products, Inc. (Form-Saver)	
	Accepted equal	

2.2 MATERIALS

- A. Refer to Section 01 60 00 for basic requirements for products and materials.

- B. Unless expressly accepted by Owner's Representative, all lumber brought onto jobsite for use as forms, shoring, or bracing shall be new material of grade shown on accepted shop drawings. Form surfaces shall be smooth.
- C. Form materials that remain or leave residues on or in concrete must be classified as acceptable for potable water use by Environmental Protection Agency within 30 days of application or use. Concrete formwork containing arsenic or other toxic materials shall be removed from jobsite and disposed of off-site.
- D. Formwork shall be constructed of the following materials:

ITEM	MATERIAL	SPECIFICATION
Wall Forms	Steel	Design per ACI 347 Provide rubber grommets where ties pass through forms to prevent loss of cement paste.
	Plywood panel	PS1 Class 1 edge-sealed Douglas Fir or Southern Yellow Pine plywood 5/8" minimum thickness with stud spacing close enough to prevent deflection marks.
	Floor gasket	1" to 1½" diameter polyethylene rod gasket to seal bottom of wall forms resting on floor slabs or footings to prevent loss of fines and paste during concrete placing and vibration.
Column Forms	Steel or Fiberglass	Design per ACI 347 Provide rubber grommets where ties pass through forms to prevent loss of cement paste.
	Plywood Panel	PS1 Class 1 edge-sealed Douglas Fir or Southern Yellow Pine plywood 5/8" minimum thickness Stud spacing close enough to prevent deflection marks.
Roof and Floor forms	Plywood	ACI 347, PS1 Class 1 edge-sealed Douglas Fir or Southern Yellow Pine plywood 5/8" minimum thickness Stud spacing close enough to prevent deflection marks.
All Other Forms	Steel Panels or Tongue-and-Groove Lumber	ACI 347 Provide rubber grommets where ties pass through steel forms to prevent loss of cement paste.
	Plywood	ACI 347, PS1 Class 1 edge-sealed Douglas Fir or Southern Yellow Pine plywood ¾" minimum thickness Stud spacing close enough to prevent deflection marks.
Lumber for Falsework	Douglas Fir or Southern Yellow Pine	PS 20 Construction Grade or better
Plywood Forms for Surfaces to be Painted	Plywood	Medium Density Overlaid Plywood, MDO Ext. Grade
Form Ties	Plastic	Plastic removable cone type with integral water stops. Do not use wire form ties. Do not use snap ties which cause spalling of concrete upon form stripping or tie removal.

E. The following product design criteria, options and accessories are required:

ITEM	DESCRIPTION	
Forms and Falsework Strength Design	Design Load	Design for total dead load plus live load of 50 psf.
	Minimum Vertical Design Load	100 psf. Design of structures shown on drawings includes no allowance for imposed construction loads. Provide forms, shoring and falsework adequate for dead loads and live loads plus all imposed vertical and lateral loads during construction.
Chamfers and Fillets	Chamfers	Provide 3/4" chamfer on exterior corners except where otherwise shown.
	Fillets	Do not provide fillets on reentrant corners except where shown.
Form Ties – Water Retaining Structures or Structures in Contact with Groundwater	Maximum Diameter of Removable Cone	1 1/2"
	Holes	Form ties shall leave holes of regular shape for reaming.
	Design	Provide with plastic cone or other means of forming conical hole to ensure form tie may be broken off back of concrete face.
	Removable Taper Ties	May be used if accepted by Owner's Representative. Insert preformed neoprene or polyurethane tapered plug (sized to seat at wall center) in hole left by taper tie removal.
Form Coating	Acceptable Materials	Non-grainraising, nonstaining resin or polymer type coating
	Unacceptable Materials	Coatings leaving residual matter on concrete surface. Coatings adversely affecting concrete bonding to paint, plaster, mortar, protective coatings, waterproofing or other applied materials. Coatings containing mineral oils, paraffins, waxes or other nondrying ingredients.
Form Joint Sealers	Design	Resilient foam rubber strips, non-hardening plastic type caulking compound free of oil.
	Alternate Design	Waterproof pressure sensitive plastic tape of minimum 8-mil thickness and 2" width.
	Form Tie Hole Filling	Use rubber plugs, plastic caulking compound or equal

PART 3 - EXECUTION

3.1 PREPARATION

- A. Make field measurements needed to install concrete formwork before submitting shop drawings or ordering. Make minor changes in dimensions and alignments as needed to avoid utilities or structural conflicts.
- B. Install plumb and string lines before placing concrete and maintain throughout concrete placement.

- C. Set pipe stubs, wall sleeves, anchor bolts and other embedded work in forms where required before placing concrete. Use templates to maintain anchor bolts in position during concrete placing.
- D. Embedded items shall be subject to the following constraints.
 - 1. Locate embedded items so as not to reduce strength of construction.
 - 2. No embedded item (parallel to surface) shall have an outside diameter greater than $\frac{1}{3}$ of slab or wall thickness.
 - 3. Embedded items parallel to surface shall be placed between top or interior reinforcing steel and bottom or exterior reinforcing steel.
 - 4. Embedded items shall not be spaced closer than 3 diameters on center. Diameter shall be taken as largest outside diameter of embedded item.
 - 5. Embedded items shall be supported independently from reinforcing steel in manner preventing metallic contact and electrolytic deterioration.
 - 6. Walls or slabs $4\frac{1}{2}$ " or less in thickness shall have no embedded items (parallel to surface) other than conduit.
 - 7. For corrosion protection, place embedded metallic items so at least 2" clearance is provided between any embedded metallic item and any part of concrete reinforcement. Do not secure embedded items in place by wiring or welding to reinforcement.
 - 8. Supplemental reinforcing shall be placed around openings as required.
- E. Thoroughly clean forms and embedments before placing concrete.
 - 1. Remove any encrusted dirt, concrete, mortar or grout from forms or embedments.
 - 2. Treat form surfaces with a lubricant acceptable to the Owner's Representative at least 2 weeks before using forms.
 - 3. Remove any excess lubricant before placing concrete.
 - 4. Take care to keep lubricant off surfaces of steel reinforcement and embedded items.

3.2 INSTALLATION

- A. Furnish and install concrete formwork at locations shown on Plans and Submittals.
- B. The following installation standards shall be followed:
 - 1. Manufacturer's installation and warranty requirements
 - 2. Applicable OSHA and Cal OSHA regulations

3. Applicable building code requirements

- C. Refer variances between above documents and Contract Documents to Owner's Representative.
- D. Install concrete formwork to tolerances recommended by Manufacturer and as described below to meet tolerances shown under "Field Quality Control." Unless otherwise shown, install concrete formwork true, plumb and level using precision gauges and levels.
- E. Form all vertical surfaces except where concrete placement against earth is shown.
- F. For members of comparatively limited height, where character of ground is such it can be trimmed to required lines and stand securely without caving or sloughing throughout concrete placement, Owner's Representative may permit placing concrete against earth at Contractor's risk. Should ground fail during concrete placement for any reason, including weather, or other natural or manmade causes, Contractor shall remove concrete in areas of earth failure and reconstruct with forms and new concrete at Contractor's sole expense.
- G. Where concrete is permitted to be placed against trimmed ground in lieu of forms, add at least 1" thickness of additional concrete to face of concrete being formed against earth.
- H. Where taper ties are approved for use, larger end of taper tie shall be on wet side of walls in structures retaining water or groundwater
- I. Secure gaskets at bottom of wall forms before placing concrete.
- J. Provide adequate cleanout holes at bottom of each lift of forms.
- K. Provide form windows where concrete cannot be placed from top of wall in manner that meets contract document requirements.
- L. Quantity and dimensions of cleanout holes and form windows shall be subject to approval by Owner's Representative.
- M. Concrete construction joints shall only be made where shown on Contract Documents and accepted shop drawings or approved in writing by Owner's Representative. When second lift is placed on hardened concrete, Contractor shall take care to ensure quantities, locations, and tightness of form ties prevents unsatisfactory effects on finished concrete.

3.3 FIELD QUALITY CONTROL

- A. Monitor plumb and string line positions continually throughout concrete placement and correct deficiencies immediately.
- B. Special inspection and field testing required by Chapter 17 of the CBC (Table 1704.4) shall be completed by an ICC-certified special inspector selected by Owner and shall include:

ITEM	TEST FOR	TEST STANDARD (ASTM OR OTHER TEST STANDARD)	FREQUENCY	FIRST TEST PAID FOR BY	RETESTS PAID FOR BY
Concrete Formwork	Shape, Location and Dimensions of Item Being Formed	ACI 318 6.1.1, and paragraph C below	Periodic per CBC Table 1704.4	Owner	Contractor to reimburse Owner for costs of first deputy inspector if re-inspection is required

C. Additional field testing shall include:

ITEM	TEST FOR	TEST STANDARD (ASTM OR OTHER TEST STANDARD)	FREQUENCY	FIRST TEST PAID FOR BY	RETESTS PAID FOR BY
Formwork and Finished Concrete	Tolerance of Finished Concrete Work	As described below and ACI 117 Manometer survey may be required for horizontal slabs to demonstrate compliance	Inspection at Owner's discretion (may occur after concrete is in place)	Owner	Owner

D. Tolerances of finished concrete shall be as follows:

ITEM	TOLERANCE
Variation of Constructed Linear Outline from Established Position in Plan	1/4" maximum in 10' 1/2" maximum in 20' or more
Variation from Level or from Grades Shown	1/4" maximum in 10' 1/2" maximum in 20' 3/4" maximum over entire structure
Variation from Plumb	1/4" maximum in 10' 1/2" maximum in 20' or more
Variation in Thickness of Slabs and Walls	Minus 1/4" Plus 1/2"
Variation in Locations and Sizes of Slabs and Wall Openings	±1/4"

3.4 ADJUSTING AND CLEANING

A. Remove forms being careful not to damage concrete. Contractor shall remedy damage from improper or premature form removal at his sole expense.

1. No heavy loading on green concrete will be permitted.
2. Forms supporting non-load bearing vertical members including walls and columns shall remain in place for at least 2 days.
3. Forms supporting roof slabs and above-ground floor slabs shall remain in place for at least 14 days and until test cylinders for supported item show all

tested concrete has attained 90% of specified 28-day compressive strength,

4. In addition, forms supporting roof slabs and above-ground floor slabs shall remain in place and until test cylinders for slabs, panels, walls, columns, and supporting members adjacent to that item show all tested concrete has attained 90% of specified 28-day compressive strength,
5. Time required to reach 90% of specified 28-day compressive strength shall be established by Owner's Representative based on test cylinders taken for this purpose.
6. Forms for all items of work not specifically mentioned herein shall remain in place for time periods determined by Owner's Representative.
7. Immediately after removing forms, wet concrete surfaces and keep surface moist until curing procedures begin.
8. Do not apply construction, equipment or permanent loads on columns, supported slabs or supported beams until all concrete in load path to foundation has attained 28-day design compressive strength.

B. Form tie removal shall proceed as follows:

1. No form-tying device or part thereof other than metal shall be left embedded in concrete.
2. Do not remove ties in such manner as to leave a hole extending through interior of concrete members.
3. Where metal rods extend through concrete to support or strengthen forms, rods shall remain embedded and shall terminate at least 1" back from formed face or faces of concrete,
4. Where taper ties are removed, ream holes left by removal of form tie cones with suitably toothed reamers. Finished surface of holes shall be clean and roughened for bond before being filled with mortar.
5. A precast neoprene or polyurethane tapered plug shall be placed at wall centerline. Hole shall then be completely filled with non-shrink or regular cement grout for above grade walls that are dry on both sides.
6. Exposed faces of walls and ceilings, and floors shall have outer 2" of exposed face filled with cement grout matching color and texture of surrounding wall surface.

C. Forms may be reused only if in good condition and only if acceptable to Owner's Representative.

1. Light sanding between uses will be required wherever necessary to obtain uniform surface texture on all exposed concrete surfaces.

2. Fill residual tie rod holes with metal caps or other methods accepted by Owner's Representative.
3. Thoroughly clean form before reuse.

**** END OF SECTION ****

**SECTION 03 20 00
CONCRETE REINFORCING**

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Materials, testing, and installation of steel reinforcement in concrete and masonry, including reinforcing bar, welded wire fabric, couplers, concrete inserts, wires, clips, supports, chairs, spacers, epoxy embedment, and other embedded accessories.

1.2 RELATED WORK

- A. Section 01 30 00: Contractor Submittals
- B. Section 01 40 00: Quality Control
- C. Section 01 53 00: Protection of Existing Facilities
- D. Section 01 55 00: Site Access and Storage
- E. Section 01 60 00: Products, Materials, Equipment and Substitutions
- F. Section 03 10 00: Concrete Forming
- G. Section 03 30 00: Cast-in-Place Concrete

1.3 SYSTEM DESCRIPTION

- A. Furnish and install complete steel reinforcement including appurtenant structural, mechanical and/or electrical mountings or connections required for compliance with Manufacturer's installation requirements and compliance with applicable building codes and standards.

1.4 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workmen trained and experienced in necessary trades and crafts and completely familiar with specified requirements and methods for proper performance of Work of this section.
- B. Factory testing shall include:

ITEM	TEST FOR	TEST STANDARD (ASTM OR OTHER TEST STANDARD)	FREQUENCY	FIRST TEST PAID FOR BY	RETESTS PAID FOR BY
Steel Reinforcement	Material Properties	ASTM A615	As required by Owner	Owner	Contractor
Steel Reinforcement	Compliance with AWS D1.4	AWS D1.4	As required by Owner	Owner	Contractor
Welding	Radiographic testing	AWS D1.4	As required by Owner	Owner	Contractor

1.5 REFERENCES

- A. ACI 117 Standard Tolerances for Concrete Construction Materials
- B. ACI 315 Details and Detailing of Structural Reinforcement

- C. ACI 318 Building Code Requirements for Reinforced Concrete
- D. ASTM A82 Steel Wire, Plain, for Concrete Reinforcement
- E. ASTM A185 Welded Steel Wire Fabric, Plain, for Concrete Reinforcement
- F. ASTM A615 Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
- G. ASTM A706 Low-Alloy Steel Deformed Bars for Concrete Reinforcement
- H. ASTM A775 Epoxy-Coated Reinforcing Steel Bars
- I. ASTM A934 Epoxy-Coated Prefabricated Steel Reinforcing Bars
- J. ASTM C1116 Fiber-Reinforced Concrete
- K. ASTM D3963 Fabrication and Jobsite Handling of Epoxy-Coated Steel Reinforcing Bars.
- L. AWS D1.4 Structural Welding Code – Reinforcing Steel
- M. California Building Code (CBC)
- N. CRSI MSP Concrete Reinforcing Steel Institute Manual of Standard Practice
- O. SSPWC Standard Specifications for Public Works Construction (Greenbook) Section 201-2 "Reinforcement for Concrete"
- P. WRI Manual of Standard Practice for Welded Wire

1.6 SUBMITTALS

A. Furnish the following submittals.

SUBMITTAL	DESCRIPTION	
CBC Chapter 17 Special Inspection Required Contractor Statement of Responsibility	As required in CBC Section 1706	
Shop Drawings	Shop bending diagrams, placing lists and drawings of reinforcing steel required per structural shop drawing requirements. Comply with ACI 315.	
	Show actual bar lengths to nearest inch measured to intersection of tangent extensions of outside bar surface. Bar placement diagrams shall clearly show dimensions of each bar splice. Show location of any coupler used with details of how they are installed in formwork.	
	Show locations of construction and expansion joints. Show locations of all embedded items including anchor bolts, wall sleeves, conduit and piping which may conflict with steel reinforcing	
Catalog Data	Required for mechanical couplers with ICBO test reports per catalog data requirements.	
Installation Instructions	Submit written welding procedure for each type of rebar weld for each size of bar intended to be spliced by welding. (A mere statement that AWS procedures will be followed is unacceptable.)	
Test Record Transcripts	For each load of steel reinforcement delivered, submit mill certificates and Manufacturer's certification of chemical and physical properties of steel as needed to verify steel materials. Also, submit information needed to determine carbon equivalent of any steel to be welded in accordance with AWS D1.4 and per test record transcript requirements. For epoxy-coated steel reinforcing, submit evidence plant is certified under CRSI Fusion-Bonded Epoxy Coating Applicator Plant Certification Program.	
Material Samples	Required from each heat of reinforcing steel upon Owner's Representative's request. Sample quantities required if requested shall conform to SSPWC	

SUBMITTAL	DESCRIPTION	
	Section 201-2.4 Required for each type of welded splice upon Owner's Representative's request.	
Welder Qualification Certificates	Required as specified in AWS D1.4 for all welders performing welding of steel reinforcement. Also submit certifications of procedure qualifications for each welding procedure used.	

- B. Refer to Section 01 30 00 for definition of requirements for shop drawings, catalog data, installation instructions, test record transcripts, and material samples.

1.7 DELIVERY, STORAGE AND HANDLING

- A. Refer to contract documents for delivery, storage, and handling requirements.
- B. CRSI recommendations included in Manual of Standard Practice for delivery, storage and handling of steel reinforcement shall be strictly followed.
- C. Bundle reinforcement and tag with suitable identification to facilitate sorting, placing and transport.
- D. Bars with kinks or bends not shown on shop drawings shall be removed from site.
- E. Bars with rust, scale, oil or any other coating that would reduce or destroy bond between concrete and steel shall be removed from site.
- F. Epoxy-coated reinforcing bars shall be stored, transported and placed in accordance with ASTM D3963 and in such a manner to avoid chipping of epoxy coating.
1. Use nonabrasive fabric slings for handling.
 2. Repair any chips in epoxy coating with compatible epoxy repair material accepted by bar supplier before placing concrete.
 3. Use plastic-headed concrete vibrators during concrete placement around epoxy-coated rebar.

1.8 PAYMENT

- A. Payment for Work in this section shall be included as part of the lump-sum for Bid Item No. 1.

PART 2 – PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Acceptable Manufacturers include:

ITEM	MANUFACTURER	MANUFACTURER LOCATION
Mechanical Bar Couplers	Dayton Superior (Dowel Bar Splicer System)	Dayton, OH
	Erico Products, Inc. (Lenton Form Saver)	Solon, OH
	Richmond Screw Anchor Company (Dowel Bar Splicer System)	Fort Worth, TX
	Accepted equal	
Rebar Anti-Corrosion Coating	Pecora Corporation	Harleysville, PA
	Accepted equal	
Epoxy Grout Systems for Rebar Dowels into Existing Concrete	Edoco "BurkEpoxy NS"	Kansas City, KS
	Master Builders Inc. "Concresive Paste LPL"	Cleveland, OH
	Pecora Corporation "Dynapoxy EP430 Fast"	Harleysville, PA
	Sika Corporation "Sikadur 31 Hi-Mod Gel" (vertical or overhead applications)	Lyndhurst, NJ
	Sika Concrete Restoration Systems SikaDur 32, Hi-Mod LPL	Lyndhurst, NJ
	Simpson Strong Tie Co.	Dublin, CA
	Accepted equal	
Epoxy-Coated Rebars	Obtain from plant certified under CRSI Fusion-Bonded Epoxy Coating Applicator Plant Certification Program.	
Rebar Supports	Dayton Superior	Dayton, OH
	Accepted equal	

2.2 MATERIALS

- A. Refer to Section 01 60 00 for basic requirements for products and materials.
- B. Materials which remain or leave residues on or within concrete shall be classified as acceptable for potable water use by Environmental Protection Agency within 30 days of application or use.
- C. Steel reinforcement shall be constructed of the following materials:

ITEM	MATERIAL	SPECIFICATION
Steel Bar Reinforcement	Steel	ASTM A615 Grade 60 Billet Steel Deformed Bars
Steel Bar Reinforcement – Epoxy Coated	Epoxy-Coated Steel	ASTM A775 or ASTM A934 Grade 60
Tie Wire	Annealed Steel	16 gauge minimum

- D. Bar supports, chairs or dobies shall comply with CRSI Manual of Standard Practice Chapter 3 and shall be constructed of the following materials:

ITEM	MATERIAL	SPECIFICATION
Concrete Blocks (Dobies) (Do not use in slabs or walls less than 6 inches thick, or where architectural finish is to be applied.)	Concrete	Minimum 28-day compressive strength f'_c equal to that of concrete but not less than 4000 psi. Embed wire ties in concrete block bar supports.

ITEM	MATERIAL	SPECIFICATION
Plastic Bar Supports (Do not use on grade)	Plastic	CRSI Class 1 gray
Wire Bar Supports (Do not use in wastewater environments or environments exposed to continuous moisture, water or corrosion.)	Steel Wire	CRSI Class 1 (with 1/8-inch-thick gray plastic coating) / Class 1A (epoxy coated, vinyl coated or plastic coated for use with epoxy-coated rebar

E. The following product design criteria, options and accessories are required:

ITEM	DESCRIPTION
Mechanical Couplers	Provide where shown on approved shop drawings. Couplers shall develop 125% of yield strength of reinforcement being spliced. Do not reduce bar cross section to accommodate couplers. Threaded couplers require use of next larger size of reinforcing. Supply all components needed for complete splice.
Bending and Forming Bars	Conform to ACI 315 and ACI 318. Fabricate to tolerances shown in ACI 117. Reinforcing for masonry shall be shop fabricated, ready for installation by masons.

PART 3 - EXECUTION

3.1 Preparation

A. Make field measurements needed to install steel reinforcement before submitting shop drawings or ordering. Make minor changes in dimensions and alignments as needed to avoid utilities or structural conflicts.

3.2 Installation

A. Furnish, accurately position and install steel reinforcement at locations shown on Plans and Submittals.

B. The following installation standards shall be followed:

1. Manufacturer's installation and warranty requirements
2. Applicable OSHA and Cal OSHA regulations
3. California Building Code Chapter 19 "Concrete" Section 1907 "Modifications to Reinforcement" and Section 1908 "Modifications to ACI 318"
4. Other applicable building code requirements
5. ACI 315 Details and Detailing of Structural Reinforcement
6. ACI 318 Building Code Requirements for Reinforced Concrete
7. For epoxy-coated rebar, comply with ASTM D3963

- C. Refer variances between above documents and Contract Documents to Owner's Representative.
- D. Minimum cover for non-pre-stressed steel reinforcement per ACI 318 shall be as follows:

LOCATION	BAR SIZE	MINIMUM COVER
Concrete Cast Against and Permanently Exposed to Earth	#3 - #11	3.0"
Formed Concrete Exposed to Earth or Weather	#3 - #5	2.0"
	#6 - #11	2.0"

- E. Minimum spacing between parallel bars per ACI 318 shall be 1 inch or 1 bar diameter, whichever is greater.
- F. Installation of steel reinforcement bars shall proceed as follows:
1. Install steel reinforcement to tolerances shown in ACI 117 and Section 7.5 of ACI 318.
 2. Do not straighten or re-bend reinforcing steel in manner that will damage material. Do not use bars with bends not shown on Plans. Bends shall be cold-bent. Do not use heat.
 3. Reinforcing shall be supported and wired together to prevent displacement using annealed iron wire ties or suitable clips at intersections. Use concrete, plastic or metal supports, spacers or metal hangers which are strong and rigid enough to prevent displacement of steel during concrete placement.
 4. Where concrete is placed against earth, use supporting concrete dobies in sufficient numbers to support bars without settlement, but in no case shall support be continuous. Tie reinforcing steel to dobies with wire ties embedded in blocks.
 5. Where concrete is placed over formwork, furnish concrete, metal, plastic or other acceptable bar chairs and spacers.
 6. Bend tie wires away from forms to provide specified concrete cover.
 7. Accessories used to support reinforcing bars shall be placed and spaced such that deflections of supports due to weight of supported bars is within tolerances specified by ACI 117 and ACI 318.
 8. Where additional bars are provided by Contractor for any reason, they shall be provided at no additional cost to Owner unless Owner's preapproval is evidenced by written change order issued prior to placing steel reinforcement.
 9. Bars may be moved as necessary to avoid conflicts with other reinforcement steel, conduits or embedded items. If bars are moved by more than one bar diameter or enough to exceed specified tolerances, secure approval from Owner's Representative before placing concrete.

10. Provide additional reinforcing bars around sleeves and openings as shown on Drawings.

G. Splices shall be made as follows:

1. Splicing shall meet requirements of ACI 318 and applicable building codes unless noted otherwise on drawings.
2. Splicing of vertical bars in concrete is not permitted, except at indicated or approved horizontal construction joints or as detailed on plans or shop drawings.
3. Splicing of horizontal bars in concrete is not permitted, except as detailed on plans or shop drawings.
4. Use of mechanical couplers is not permitted, except as detailed on plans or shop drawings.
5. Welding of reinforcing bars is not permitted, except as detailed on plans or shop drawings.

H. Dowelling and epoxying of rebar into hardened concrete shall proceed as follows:

1. Hole diameter shall be as recommended by epoxy Manufacturer but shall be at least $\frac{1}{4}$ inch greater in diameter than outer surface of reinforcing bar deformations.
2. Depth of hole shall be as recommended by epoxy Manufacturer, but shall not be less than 12 bar diameters, unless noted otherwise or unless required to prevent penetration through opposite surface of existing concrete member.
3. Drill hole using methods that do not interfere with proper bonding of epoxy.
4. Field locate reinforcement in existing concrete before drilling using pachometer or other approved locator device. Adjust location of holes to be drilled to avoid drilling through or nicking any existing reinforcing bars.
5. Use compressed air to remove all dust and loose material from freshly drilled holes.
6. Inject epoxy into hole through tube placed at bottom of hole. Withdraw tube as epoxy is placed but keep injection tip immersed to prevent air pockets from forming.
7. Fill hole to a depth that ensures excess material will be expelled from hole during dowel placement.
8. Twist dowels during insertion into partially filled hole to guarantee full wetting of bar surface with epoxy. Insert bar slowly to prevent air pockets from forming.

3.3 Field Quality Control

- A. Special inspection and field testing required by Chapter 17 of CBC (Table 1704.3 and 1704.4) shall be completed by an ICBO-certified special inspector selected by Owner and shall include:

ITEM	TEST FOR	TEST STANDARD (ASTM OR OTHER TEST STANDARD)	FREQUENCY	FIRST TEST PAID FOR BY	RETESTS PAID FOR BY
Steel Reinforcement	Size Grade and Type	Compliance with Contract Documents	Periodic per CBC Table 1704.3	Owner	Contractor to reimburse Owner for costs of first deputy inspector if re-inspection is required
	Verification of Weldability (for Steel Other than ASTM A706)	AWS D1.4, & ACI 318 Sec 3.5.2	Periodic special inspection per CBC Table 1704.3		
	Welding	AWS D1.4 & ACI 318 Sec 3.5.2 Also inspect for proper dimensions and absence of cracks, undercutting, surface holes or slag inclusions	Periodic per CBC Table 1704.3		
	Placement	ACI 318 Sec 3.5, & 7.1-7.7 & CBC 1913.4	Periodic per CBC Table 1704.3		
	Epoxy Embedded Dowels	Epoxy Manufacturer's Requirements	All dowels		

**** END OF SECTION ****

**SECTION 03 30 00
CAST-IN-PLACE CONCRETE**

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Materials, testing, and installation of concrete for buried and above-ground cast-in-place structures, flatwork and paving.
- B. Refer to Section 03 10 00 for concrete forming.
- C. Refer to Section 03 20 00 for concrete reinforcing.

1.2 RELATED WORK

- A. Section 01 30 00: Contractor Submittals
- B. Section 01 40 00: Quality Control
- C. Section 01 53 00: Protection of Existing Facilities
- D. Section 01 55 00: Site Access and Storage
- E. Section 01 60 00: Products, Materials, Equipment and Substitutions
- F. Section 03 10 00: Concrete Forming
- G. Section 03 20 00: Concrete Reinforcing
- H. Section 03 60 00: Grouting
- I. Section 31 23 33: Trenching and Backfilling

1.3 SYSTEM DESCRIPTION

- A. Furnish and install complete concrete structural system including appurtenant structural, mechanical and/or electrical mountings, embedments or connections required for compliance with Manufacturer's installation requirements of other trades and compliance with applicable building codes and standards.

1.4 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workmen trained and experienced in necessary trades and crafts and completely familiar with specified requirements and methods for proper performance of Work of this section.
- B. Proportion mixes either by laboratory trial batch or field experience methods, using specified materials acceptable for each type of concrete required, and complying with ACI 211.1.
- C. Plant testing of aggregate shall include:

ITEM	TEST FOR	TEST STANDARD (ASTM OR OTHER TEST STANDARD)	FREQUENCY	FIRST TEST PAID FOR BY	RETESTS PAID FOR BY
Aggregate	Ratio of Silica Released to Reduction in Alkalinity	ASTM C33	As directed	Owner	Contractor
	Loss with Sodium Sulfate	ASTM C33	As directed	Owner	Contractor
	Sieve Analysis	ASTM C136	1 each trial batch	Owner	Contractor
Coarse Aggregate	Abrasion Loss	ASTM C33	As directed	Owner	Contractor
Fine Aggregate	Sand Equivalent	ASTM D2419	As directed	Owner	Contractor
	Organic Impurities	ASTM C40	As directed	Owner	Contractor
	Color of Supernatant on Washing	ASTM C33	As directed	Owner	Contractor

D. Plant testing shall include:

ITEM	TEST FOR	TEST STANDARD (ASTM OR OTHER TEST STANDARD)	FREQUENCY	FIRST TEST PAID FOR BY	RETESTS PAID FOR BY
Concrete	Certification of Mix Design	ACI 301 certified by independent testing laboratory	1 per mix	Contractor	Contractor
Ready-Mix Concrete Materials	Materials Inspection	See Paragraph 2.2 below	As directed	Owner	Owner

1.5 REFERENCES

- A. ACI 117 Standard Tolerances for Concrete Construction Materials
- B. ACI 211.1 Selecting Proportions for Normal, Heavyweight, and Mass Concrete
- C. ACI 214 Evaluation of Strength Test Results for Concrete
- D. ACI 301 Structural Concrete for Buildings
- E. ACI 304 Measuring, Mixing, Transporting, and Placing Concrete
- F. ACI 305 Hot Weather Concreting
- G. ACI 306 Cold Weather Concreting
- H. ACI 309 Consolidation of Concrete
- I. ACI 315 Details and Detailing of Concrete Reinforcement
- J. ACI 318 Building Code Requirements for Reinforced Concrete
- K. ACI 350 Environmental Engineering Concrete Structures
- L. ASTM A820 Steel Fibers for Fiber-Reinforced Concrete
- M. ASTM C31 Making and Curing Concrete Test Specimens in Field
- N. ASTM C33 Concrete Aggregates
- O. ASTM C39 Compressive Strength of Cylindrical Concrete Specimens
- P. ASTM C40 Organic Impurities in Fine Aggregates for Concrete

- Q. ASTM C42 Obtaining and Testing Drilled Cores and Sawed Beams of Concrete
- R. ASTM C78 Flexural Strength of Concrete Using Simple Beam with Third Point Loading
- S. ASTM C88 Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate
- T. ASTM C94 Ready-Mixed Concrete
- U. ASTM C117 Materials Finer than 75- μ m (No. 200) Sieve in Mineral Aggregates by Washing
- V. ASTM C136 Sieve Analysis of Fine and Coarse Aggregates
- W. ASTM C138 Unit Weight, Yield, and Air Content (Gravimetric) of Concrete
- X. ASTM C143 Slump of Hydraulic Cement Concrete
- Y. ASTM C150 Portland Cement
- Z. ASTM C156 Water Retention by Concrete Curing Materials
- AA. ASTM C157 Length Change of Hardened Hydraulic Cement Mortar and Concrete
- BB. ASTM C172 Sampling Freshly Mixed Concrete
- CC. ASTM C173 Air Content of Freshly Mixed Concrete by Volumetric Method
- DD. ASTM C191 Time of Setting of Hydraulic Cement by Vicat Needle
- EE. ASTM C192 Making and Curing Concrete Test Specimens in Laboratory
- FF. ASTM C231 Air Content of Freshly Mixed Concrete by Pressure Method
- GG. ASTM C260 Air Entraining Admixtures for Concrete
- HH. ASTM C266 Time of Setting of Hydraulic Cement Paste by Gillmore Needles
- II. ASTM C289 Potential Alkali-Silica Reactivity of Aggregates (Chemical Method)
- JJ. ASTM C309 Liquid Membrane-Forming Compounds for Curing Concrete
- KK. ASTM C330 Lightweight Aggregates for Structural Concrete
- LL. ASTM C494 Chemical Admixtures for Concrete
- MM. ASTM C595 Blended Hydraulic Cement
- NN. ASTM C618 Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete
- OO. ASTM C881 Epoxy-Resin-Base Bonding Systems for Concrete
- PP. ASTM C932 Surface-Applied Bonding Compounds for Exterior Plastering
- QQ. ASTM C989 Ground Granulated Blast-Furnace Slag for Use in Concrete and Mortars
- RR. ASTM C1017 Chemical Admixtures for Use in Producing Flowing Concrete
- SS. ASTM C1077 Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation
- TT. ASTM C1116 Fiber-Reinforced Concrete
- UU. ASTM C1157 Performance Specification for Hydraulic Cement
- VV. ASTM C1240 Silica Fume Used in Cementitious Mixtures
- WW. ASTM D1751 Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)
- XX. ASTM D2419 Sand Equivalent Value of Soils and Fine Aggregate
- YY. ASTM E119 Fire Tests of Building Construction and Materials
- ZZ. California Building Code (CBC)
- AAA. California Green Building Standards Code (CALGreen Code)
- BBB. Caltrans Standard Specifications – Section 90 Portland Cement Concrete
- CCC. California Test Method 214 Soundness of Aggregates
- DDD. California Test Method 227 Cleanness Value
- EEE. California Test Method 229 Durability
- FFF. California Test Method 515 Relative Mortar Strength of Portland Cement Concrete Sand

- GGG. California Test Method 530 Effect of Water-Reducing and Set-Retarding Admixtures on Drying Shrinkage of Concrete
- HHH. Fed Spec UU-B-790A Building Paper, Vegetable Fiber (Kraft, Waterproofed, Water Repellent and Fire Resistant
- III. SSPWC Standard Specifications for Public Works Construction (Greenbook) Section 201 "Concrete, Mortar, and Related Materials
- JJJ. SSPWC Standard Specifications for Public Works Construction (Greenbook) Section 303 "Concrete and Masonry Construction."

1.6 SUBMITTALS

- A. Furnish the following submittals in accordance with ACI 301 and California Building Code.

SUBMITTAL	DESCRIPTION	
CBC Chapter 17 Special Inspection Required Contractor Statement of Responsibility	As required in CBC Section 1704	
Shop Drawings	Required per structural shop drawing requirements. In addition to requirements listed under steel reinforcement, show construction joints and placement schedule.	
Catalog Data	Required for admixtures and curing compounds per catalog data requirements.	
Installation Instructions	Required for admixtures per installation instruction requirements. Submit materials and methods for curing per installation instruction requirements.	
Certificate of Compliance	Submit certification from independent testing laboratory mix design complies with these specifications.	
	Submit mill test certification including fineness for each shipment of cement per ACI 301.	
	Submit aggregate gradation and certification per ACI 301.	
	Submit admixture certification including chloride ion content per ACI 301. At least 24 hours before placing concrete, submit certification from each trade having embedded items in concrete to be placed stating embedded items for each trade are properly located, placed and braced and equipment pads are properly sized.	
Engineering Calculations (Mix Design)	Required for concrete mix design per engineering calculations requirements sealed by California-licensed Civil Engineer.	
	In addition to original mix design, provide new mix design if change in brand or type of cement or change in source or gradation of aggregates is permitted or if defective concrete occurs.	
Brand and Type of Cement/Source of Aggregate	Submit brand and type of cement and source of aggregates to allow sampling and testing by Owner's Representative.	
Welder Qualification Certificates	Required for all welders performing reinforcement welding	
Delivery Tickets	Required for ready-mix concrete as needed to document delivery quantities. In accordance with ASTM C94 Sections 16.1 and 16.2, each ticket shall show <ul style="list-style-type: none"> • Name of ready-mix batch plant, • Serial number of ticket, 	

SUBMITTAL	DESCRIPTION	
	<ul style="list-style-type: none"> • State certified equipment used in preparing mix, • Truck number, • Name of purchaser & name & location of job • Mix number, • Quantities by weight of cement, sand, each class of aggregate, admixtures and water added in batching plant, • Type and brand of cement & admixtures, • Source & identification of aggregates, • Amount of water allowed to be added at site for specified mix, • Total yield in cubic yards, • Date & time of day to nearest minute corresponding to time batch was dispatched, time batch left plant, time batch arrived on site, time unloading began and time unloading was completed. • Reading of revolution counter at first addition of water <p>Certificates shall be from public weighmaster. Owner's Representative will not accept concrete in absence of certificate.</p>	
Warranty	Furnish one-year warranty from date of final acceptance	

- B. In addition to requirements of ACI, refer to Section 01 30 00 for definition of requirements for Shop Drawings, Catalog Data, Installation Instructions, Certificates of Compliance, Engineering Calculations, Test Record Transcripts, and Material Samples.

1.7 DELIVERY, STORAGE AND HANDLING

- A. Refer to contract documents for delivery storage and handling requirements.
- B. Manufacturer's instruction and warranty requirements for delivery, storage and handling of concrete admixtures and curing compounds shall be strictly followed.
- C. Storage of materials shall conform to requirements of ACI 301 or SSPWC.
- D. Store materials to prevent damage by moisture or breakage.
- E. Store sacked cement in manner permitting access for inspection and sampling.
- F. Use cement in sequence of receipt of shipments.
- G. Coarse aggregate with maximum size greater than 3/4" shall be prepared, stored, and handled in 2 or more size groups. When aggregates are proportioned for each batch of concrete, the 2 size groups shall be combined.
- H. Do not use any aluminum materials for handling concrete.

1.8 PAYMENT

- A. Payment for Work in this section shall be included as part of the lump-sum for Bid Item No. 1.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Acceptable Manufacturers include:

ITEM	MANUFACTURER	MANUFACTURER LOCATION
Admixtures – Air Entraining (Use when freeze-thaw cycles are expected)	Accepted equal	
Admixtures – Damp proofing – Integral Hydrophobic Waterproofing (Alternate to crystalline waterproofing)	Hycrete	Carlstadt, NJ
	Accepted equal	
Admixtures – Plasticizers	Accepted equal	
Admixtures – Set Accelerating (Use when air temperature is less than 40F)	Grace Concrete Products "Daraset"	Cambridge, MA
	Master Builders Inc. "Pozzutec 20"	Cleveland, OH
	Sika Corporation "Plastocrete 161FL"	Lyndhurst, NJ
	Accepted equal	
Admixtures – Set Retarding (Use when air temperature exceeds 80F)	Grace Concrete Products "Daratard"	Cambridge, MA
	Master Builders Inc. "Pozzolith 300R"	Cleveland, OH
	Sika Corporation "Plastocrete"	Lyndhurst, NJ
	Accepted equal	
Admixtures – Water Reducing (Normal Range)	Grace Concrete Products "WRDA 79"	Cambridge, MA
	Master Builders Inc. "Pozzolith 322-N"	Cleveland, OH
	Sika Corporation "Plastocrete 161"	Lyndhurst, NJ
	Accepted equal	
Admixtures – Water Reducing (High Range)	Grace Concrete Products "WRDA 19 or Duracem 100"	Cambridge, MA
	Master Builders Inc. "Rheobuild 716 or Rheobuild 1000"	Cleveland, OH
	Sika Corporation "Sikament FF or Sikament 86"	Lyndhurst, NJ
	Accepted equal	
Bonding Agent (Hardened Concrete to Fresh Concrete)	Edoco "BurkEpoxy MV"	Kansas City, KS
	Concresive Div BASF 1001 LPL	Freeport, TX
	Epoxtile 2391	
	Euco Epoxy 463	
	Master Builders Inc. "Concresive Liquid LPL"	Cleveland, OH
	Pecora Corporation "Dynapoxy EP420"	Harleysville, PA
	Sika Corporation "Sikadur 32 Hi-Mod" or "Sikadur 32 Hi-Mod (LPL)" Epoxy Adhesive	Lyndhurst, NJ
Accepted equal		
Epoxy Bonding Adhesive for Rebar	Edoco "BurkEpoxy NS"	Kansas City, KS
	Master Builders Inc. "Concresive Paste LPL"	Cleveland, OH

ITEM	MANUFACTURER	MANUFACTURER LOCATION
	Pecora Corporation "Dynapoxy EP430 Fast"	Harleysville, PA
	Sika Corporation "Sikadur 31 Hi-Mod Gel" (vertical or overhead applications)	Lyndhurst, NJ
	Sika Concrete Restoration Systems SikaDur 32, Hi-Mod LPL	Lyndhurst, NJ
	Simpson Strong Tie Co.	Dublin, CA
	Accepted equal	
Curing Compounds Use where air quality regulations do not prohibit use of solvent based compounds	Edoco "Spartan Cote Cure-Seal Hardener"	Kansas City, KS
	Euclid Chemical Company "Aqua-Cure"	Cleveland, OH
	Master Builders Inc. "Masterkure-W"	Cleveland, OH
	Accepted equal	
Curing Compounds (Water-Based Resin Type) Use where air quality regulations prohibit use of solvent based compounds	Edoco "Aqua Resinure"	Kansas City, KS
	Euclid Chemical Company "Super Rez Seal"	Cleveland, OH
	Master Builders Inc. "MB429"	Cleveland, OH
	Accepted equal	
Damp proofing Agent	Euclid Chemical Company	Cleveland, OH
	W. R. Meadows Inc. "Sealmastic"	Hampshire, IL
	Sonneborn Div. Chemrex Inc. "Hydrocide 600"	Shakopee, MN
	Accepted equal	
Evaporation Retardant for Curing	Euclid Chemical Company "Eucobar"	Cleveland, OH
	Master Builders Inc. (Confilm)	Cleveland, OH
	Accepted equal	

- B. Only one brand of cement shall be used.
- C. All admixtures shall be compatible and by a single Manufacturer capable of providing qualified field service representation.

2.2 MATERIALS

- A. Refer to Section 01 60 00 for basic requirements for products and materials.
- B. Concrete structural systems shall be constructed of the following materials:

ITEM	MATERIAL	SPECIFICATION
Cement	Standard Brand Portland Cement	ASTM C150 Type I Normal Type II Modified Low Alkali Type III High Early Strength Type IV Low Heat of Hydration Type V Sulfate Resistant Also meet Table 2 optional requirements At least 85% of cement by weight shall pass 325 screen. NSF 61-certified for potable water tanks where finished concrete will contact potable water, and NSF 61-certified cement is available within 25-mile radius of project site.
	Supplementary Cementitious Materials	ASTM C595 and California Green Building Standards Code Section A5.405.5 (See below)
Water	Clean, Clear Potable Water	TDS<1000 mg/l
Coarse Aggregate	Specification	Meet ASTM C33 requirements Gravel, crushed gravel, crushed rock or combination From pits acceptable to Owner's Representative
	Cleaness Value per California Test Method 227	75 minimum
	Percentage Wear per ASTM C131	Abrasion loss < 10.5% after 100 revolutions
		Abrasion loss < 42% after 500 revolutions
	Specific Gravity per ASTM C127	2.58 minimum
	Ratio of Silica Released to Reduction in Alkalinity	1.0 maximum
Fine Aggregate	Specification	Meet ASTM C33 requirements Nonreactive clean, hard durable washed material From pits acceptable to Owner's Representative
	Organic Impurities per ASTM C40	Satisfactory Resultant color of testing solution shall not be darker than ASTM C40 standard
	Mortar Strength Relative to Ottawa Sand per California Test Method 515	100% minimum
	Sand Equivalent	>75% average for 3 samples >70% for any one sample
	Percent Clay, Silt, Loam per ASTM C117	<3%
	Soundness per California Test Method 214	<10% Soundness requirement will be waived if durability index D _r >60 per California Test Method 229.
		Ratio of silica released to reduction in alkalinity <1.0 Lightweight sand not permitted
Aggregate for Exposed Aggregate Concrete	Pea Gravel	¼" to ⅝" water washed pea rock with smooth edges
Lightweight Aggregate		ASTM C330 sand-lightweight (115 pcf) aggregate

ITEM	MATERIAL	SPECIFICATION
Surface-Applied Bonding Agent	Surface-Applied Bonding Compound	ASTM C932
Epoxy Bonding Agent	Epoxy Resin	ASTM C881
Curing Blankets	Polyethylene Sheet	White 10-mil nominal PE thickness Loss of moisture per ASTM C156<0.055 grams/cm ²
	Polyethylene-Coated Burlap	White opaque polyethylene film impregnated or extruded onto one side of burlap 4-mil nominal PE thickness Burlap weight 9oz/sy or greater Loss of moisture per ASTM C156<0.055 grams/cm ²
	Polyethylene-Coated Waterproof Paper Sheeting	White polyethylene sheeting 2- mil nominal PE thickness Permanently bond to waterproof paper per Fed Spec UU-B-790A Loss of moisture per ASTM C156<0.055 grams/cm ²
Curing Compounds		ASTM C309 White pigmented, resin based Do not use sodium silicate compounds. Meet requirements of floor hardener Manufacturer where applicable NSF 61-certified for potable water tanks where finished concrete will contact potable water.
Curing Mats	Heavy Shag Rugs, Carpets or Cotton Mats Quilted at 4" on center	Minimum dry weight of 12 oz/sy
Damp proofing	Coal Tar	Two coats of single-component self-priming heavy duty material.
Grout for Smooth Concrete Finish		1 part Portland cement (½ gray & ½ white portland cement) White portland cement to be Atlas white or equal. 1 part fine sand passing No. 16 sieve Calcium chloride (add amount equal to 5% of cement by volume.) Sufficient water to provide consistency of thick paint. NSF 61-certified for potable water tanks where finished grout will contact potable water.
Ready-Mix Concrete		ASTM C94
Repair Mortar	Two-Component Cement Based Product	Low shrinkage. Designed for repairing damaged concrete surfaces. Use medium slump repair mortar on horizontal surfaces. Use non-sag low-slump repair mortar on vertical or overhead surfaces. NSF 61-certified for potable water tanks where finished mortar will contact potable water.

- C. Concrete aggregate will be designated by number per Standard Specifications for Public Works (Greenbook) Tables 200-1.4 (B) and 200-1.5.5 (A) and shall conform to the following gradations:
- D. Concrete aggregate will be designated by letter per Standard Specifications for Public Works (Greenbook) Section 201 and shall conform to the following gradations:

PERCENTAGE PASSING SIEVES BY WEIGHT					
SIEVE SIZE	GRADING A (For concrete street paving not integral with curb)	GRADING B (For concrete channel and box inverts)	GRADING C (For Class AA, A, A2 or B concrete not used for paving or channel or box inverts. May be used for Class C Concrete)	GRADING D (May be used for Class B extruded curbs and gutters or for gunite)	GRADING E (For trench backfill, slurry and masonry grout May be used for Class C concrete.)
2"	100%	100%			
1½"	95-100%	95-100%	100%		
1"	64-80%	80-96%	95-100%		
¾"	55-71%	64-80%	77-93%	100%	100%
⅝"	37-53%	40-52%	50-70%	92-100%	90-100%
No. 4	32-42%	35-46%	39-51%	42-60%	60-80%
No. 8	25-35%	28-38%	31-41%	33-47%	50-70%
No. 16	18-28%	21-31%	22-32%	22-38%	33-53%
No. 30	10-18%	10-20%	12-22%	17-25%	19-35%
No. 50	3-9%	3-10%	3-15%	6-15%	5-15%
No 100	0-4%	0-4%	0-5%	1-6%	2-7%
No. 200	0-2%	0-2%	0-2%	0-3%	0-4%

- E. Concrete mix shall be designed to meet properties and proportions specified. In general, mix shall be designed to minimize shrinkage, surface flaws, honeycombing and rock pockets around steel reinforcing. Limiting parameters specified are not intended to be a mix design. Additional cement or water reducing agent may be required to achieve workability demanded by Contractor's methods and aggregates. Contractor is responsible for any costs associated with furnishing concrete with required workability, density and strength.
- F. Admixtures shall consist of the following materials:

ITEM	MATERIAL	SPECIFICATION
Admixtures	General Requirements	Do not use to reduce cement requirement Shall be free from thiocyanates Chloride ion <0.05% NSF 61-certified for potable water tanks where finished concrete will contact potable water.
Air-Entraining Agents (Use when freeze-thaw cycles are expected)		ASTM C260
Coloring Agents	Commercially Pure Mineral Pigments	Weight of pigments < 10% of cement content Color selected by Owner's representative
Fly Ash and other SCM's		Not permitted
Plasticizing Agents		ASTM C1017
Set Accelerating Agents (Use when air temperature is less than 40°F)		ASTM C494 Type C Do not use calcium chloride or other chloride-based accelerators in concrete having steel reinforcing or embedments.

ITEM	MATERIAL	SPECIFICATION
Set Retarding Agents (Use when air temperature exceeds 80°F)		ASTM C494 Type B
Water Reducing Agents (High Range)		ASTM C494 Type F or G Only one water-reducing admixture shall be used
Water Reducing Agents (Normal Range)		ASTM C494 Type A Only one water-reducing admixture shall be used
Water Reducing and Set Accelerating Agents		ASTM C494 Type E Only one water-reducing admixture shall be used
Water Reducing and Set Retarding Agents		ASTM C494 Type D Only one water-reducing admixture shall be used

G. The following product design criteria, options and accessories are required:

ITEM	DESCRIPTION	
Class AA "Premium" Concrete Greenbook 680-CW-5000 (Use for prestressed concrete such as shotcrete.)	f_c	4500 psi per ASTM C39
	Cement Content	680 lb cement per cubic yard minimum but \leq 700 lb cement per cubic yard
	Maximum Water/Cement Ratio	0.40 by weight
	Aggregate	SSPWC Greenbook Grading C
	Maximum Aggregate Size	1½"
	Slump	4" maximum per ASTM C143
	Water Reducing Admixture	Required
	Maximum Transit Time	60 minutes (250 revolutions maximum)
Class A "Structural" Concrete Greenbook 600-CW-4000 (Use for foundations, footings, slabs on grade, beams, columns, walls, roof and floor slabs, and other structural concrete.)	f_c	4000 psi per ASTM C39
	Cement Content	600 lb cement per cubic yard minimum but \leq 700 lb cement per cubic yard
	Maximum Water/Cement Ratio	0.45 by weight
	Aggregate	SSPWC Greenbook Grading C
	Maximum Aggregate Size	1½"
	Slump	4" maximum per ASTM C143
	Water Reducing Admixture	Required
	Maximum Transit Time	60 minutes (250 revolutions maximum)
Class A2 "Structural-No Special Inspection" Concrete. Greenbook 600-C-2500 (use for the odor control system concrete slab, and the SCADA antenna concrete support base). Owner has elected to waive CBC Special Inspection requirements for these particular structures.	f_c	2500 psi per ASTM C39
	Cement Content	600 lb cement per cubic yard minimum but \leq 700 lb cement per cubic yard
	Maximum Water/Cement Ratio	0.45 by weight
	Aggregate	SSPWC Greenbook Grading C
	Maximum Aggregate Size	1½"
	Slump	4" maximum per ASTM C143
	Water Reducing Admixture	Required
	Maximum Transit Time	60 minutes (250 revolutions maximum)
Class C "Utility" Concrete (Use where identified in plan drawings) Greenbook 520-C-2500	Cement Content	600 lb cement per cubic yard minimum but \leq 700 lb cement per cubic yard
	Maximum Water/Cement Ratio	0.45 by weight
	Aggregate	SSPWC Greenbook Grading C
	Maximum Aggregate Size	1½"
	Slump	4" maximum per ASTM C143
	Water Reducing Admixture	Required
	Maximum Transit Time	60 minutes (250 revolutions maximum)
Class D "Slurry Backfill" Concrete (Use for trench)	f_c	100 psi per ASTM C39
	Cement Content	94 lb cement per cubic yard

ITEM	DESCRIPTION	
backfill or pipe abandonment) Greenbook 94-E-100	Aggregate	¾"
	Maximum Aggregate Size	SSPWC Greenbook Grading E
	Slump	6" maximum per ASTM C143
	Water Reducing Admixture	Optional
	Maximum Transit Time	120 minutes

- H. With addition of high range water reducer, slump shall be 7" +/- 2".
- I. All materials furnished for Work shall comply with requirements of Sections 201, 203, and 204 of ACI 301 as applicable.
- J. Cement shall be clean and free from contaminants. Do not use cement reclaimed from cleaning bags or leaking containers. Do not use lumpy cement.
- K. All materials furnished for Work must be classified by Environmental Protection Agency as acceptable for potable water use within 30 days of application.

2.3 MIXES

- A. Proportioning shall meet requirements of ACI 301 Chapter 3 "Proportioning."
- B. Quantity of water shall be just sufficient to produce workable batches of concrete which can be worked into place without segregation or other flaws and compacted using vibratory methods to provide desired density, impermeability, and smoothness of surface. Adjust water quantity added if needed to adjust for variations in moisture content of aggregate while providing uniform consistency between batches. Determine consistency of batches by slump testing as described below.
- C. Mixing shall meet requirements of ACI 301 Chapter 7 "Mixing."
- D. Apply admixtures according to Manufacturer's installation and warranty requirements.
- E. Set controlling and water reducing admixtures shall be applied as follows:
 - 1. Use or addition of admixtures shall be at Contractor's option to increase workability and shall result in no increase in cost to Owner.
 - 2. Use or addition of admixtures shall be subject to approval by Owner's Representative.
 - 3. Concrete containing admixture shall be first placed at location determined by Owner's Representative.
 - 4. High range water reducing admixtures shall be added to concrete on site after all other ingredients have been mixed and initial slump has been verified. Do not use more than 14 ounces of water reducer per sack of cement. Water reducer shall be considered as part of mixing water when calculating water cement ratio.
 - 5. If high-range water reducer is added to concrete on site, it may be used in conjunction with same water reducer added at batch plant. Concrete shall have slump of 3" ±½" before adding high range water reducing admixture at job site.
 - a) High-range water-reducing admixture shall be accurately measured and pressure injected into mixer as single dose by experienced technician.

Standby system shall be provided and tested before each day's operation of job site system.

- b) Mix concrete at mixing speed for at least 30 mixer revolutions after adding high-range water reducer.

F. Re-tempering of partially hardened concrete or mortar will not be permitted.

G. Trial batch testing shall proceed as follows:

1. Before placing any concrete, testing laboratory designated by Owner's Representative shall prepare trial batch of each class of "structural" or "premium" concrete based on preliminary concrete mixes submitted by Contractor and using aggregates, cement and admixtures proposed.
2. During trial batch, testing laboratory may adjust aggregate proportions to obtain required properties. Such adjustments shall be considered refinements to mix design and shall not justify extra compensation to Contractor.
3. All concrete shall meet specified requirements whether aggregate proportions are from Contractor's preliminary mix design, or whether proportions have been adjusted during trial batch process.
4. Trial batch materials shall be sufficient to yield 3 drying shrinkage and 10 compression test specimens from each batch.
5. Test 5 cylinders at 7 days to establish 7-day average compressive strength.
6. Test remaining 5 cylinders no more than 28 days after molding.
7. Required average compressive strengths shall be as follows:

SPECIFIED COMPRESSIVE STRENGTH (f'_c)	28-DAY LABORATORY TRIAL BATCH COMPRESSIVE STRENGTH MINIMUM TEST RESULTS		28-DAY FIELD TEST COMPRESSIVE STRENGTH MINIMUM TEST RESULTS
	5-CYLINDER AVERAGE	ANY SINGLE TEST	5-CYLINDER AVERAGE
$0 < f'_c < 3000$ psi	$f'_c + 1000$ psi	f'_c	$f'_c + 600$ psi
$3000 \text{ psi} \leq f'_c < 5000$ psi	$f'_c + 1200$ psi	f'_c	$f'_c + 600$ psi
$5000 \leq f'_c$	$f'_c + 1400$ psi	f'_c	$f'_c + 600$ psi

8. Do not place "structural" or "premium" concrete until mix design has been qualified under test criteria above. Should source of materials or established procedures change, Owner may require new trial batch testing.
9. Field trial batches may be placed in Work at designated locations accepted by Owner's Representative where concrete of lower quality is required. For payment purposes, concrete so placed will be considered to be type of concrete specified at that location.

- H. Measure cement and aggregate for mixing concrete using direct weighing equipment accessible to Owner's Representative.
- I. Tolerances of measurement equipment shall be as follows:
1. Cement: Use weighing equipment accurate to $\pm 1\%$ of total weight
 2. Aggregate: Use weighing equipment accurate to $\pm 3\%$ of total weight
 3. Admixtures: Use weighing equipment accurate to $\pm 3\%$ of total weight
 4. Water: Use metering equipment accurate to $\pm 3\%$ of total volume
- J. Water feed control mechanism shall be capable of being locked in position to deliver constant flow of water to each batch of concrete. A positive quick-acting valve shall be used for cut-off in water line to mixer. Operating mechanism shall not allow leakage to occur when valves are closed.
- K. Ready mixed concrete shall meet ASTM C94 and the following additional requirements.
1. Materials used in ready-mixed concrete shall be subject to continuous inspection at batching plant by Owner's Representative.
 2. Transport and deliver all ready-mixed concrete to site using agitating equipment. Do not use non-agitating equipment or combination truck and trailer equipment to transport or deliver ready-mixed concrete.
 3. Deliver ready-mixed concrete to site and complete discharge within "maximum travel time" specified above after addition of cement to aggregates. Also, deliver mixed concrete to site and complete discharge before drum has been revolved the specified maximum number of revolutions.
 4. Truck mixers shall have electrically actuated counters to record number of revolutions of drum or blades. Counter shall be resettable recording type, and shall be mounted in driver's cab. Counters shall be actuated at time of starting mixers at mixing speeds.
 5. Completely empty mixer of any previously mixed load before adding new concrete.
 6. Each batch of concrete shall be mixed in truck mixer for at least 70 revolutions of drum or blades at rotation rate designated by equipment manufacturer. Additional mixing, if any, shall be at agitating speed designated by equipment manufacturer. All materials, including mixing water shall be in mixer drum before actuating counter to count rotations.
 7. Truck mixers and their operation shall ensure concrete throughout mixed batch is discharged within acceptable limits of uniformity of consistency, mix and grading.
 8. Slump tests taken at approximately $\frac{1}{4}$ point and $\frac{3}{4}$ points of load during discharge shall give slumps within 2" of each other. Mixers failing to meet

this requirement shall not be used on job until causing condition is corrected and satisfactory performance is verified on-site using additional slump tests. All mechanical parts of failing mixer, including water measurement and discharge apparatus, blades, rotation speed and drum clearances shall be serviced and checked before further attempt to use equipment.

9. Each delivery of ready-mixed concrete shall be accompanied by delivery ticket furnished to Owner's Representative as described in Paragraph 1.6 above.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Make field measurements needed to install Concrete structural systems before submitting Shop Drawings or ordering. Make minor changes in dimensions and alignments as needed to avoid utilities or structural conflicts.
- B. Before placing concrete within forms, each trade having embedded items, including water stops within forms and affected by pour shall certify all items are properly located, placed and braced.
- C. Earth surfaces shall be thoroughly wetted by sprinkling before placing concrete. At time of concrete placement, ground surface shall be moist, but free from standing water, mud and debris.
- D. Cold joints in concrete shall be deemed to occur whenever placement of concrete is interrupted for any reason so new concrete is neither incorporated integrally with previously placed concrete in opinion of Owner's Representative nor keyed in place with preformed construction joint shown on Contract Documents or accepted Shop Drawings. Prepare horizontal surfaces of cold joints as follows:
 1. Compacting and roughen horizontal with minimum 1/4" amplitude profile for good bond.
 2. Clean tooled joint surface of all laitance, loose or defective concrete and foreign matter by hydroblasting or sandblasting to expose aggregate.
 3. Thoroughly wash hydro-blasted or sandblasted surface with clean water.
 4. Remove all ponded water from surface of construction joints.
 5. Coat joint surface with epoxy-bonding agent unless otherwise shown.
- E. Construction joints shown on Contract Documents and accepted Shop Drawings may be made as shown with provision of keys or other locking shapes to secure proper union with subsequent work.
- F. Before placing concrete, verify location of embedded items with affected trades. Accuracy of placement of embedded items is Contractor's responsibility.

- G. Before placing concrete, secure inspection of steel reinforcement and obtain acceptance by Owner's Representative at least 4 hours before placing concrete.
- H. Before placing concrete, provide dewatering, runoff diversion and protection as needed to ensure proper and water-free environment suitable for concrete hardening and curing. Do not place concrete underwater or in spaces where standing water is present. Protect uncured concrete from exposure to rain, runoff or groundwater.
- I. Notify Owner's Representative in writing at least 24 hours before placing any concrete. Do not place concrete except when Owner's Representative or his duly authorized representative is present.
- J. Order of placement of concrete shall be acceptable to Owner's Representative. To minimize shrinkage effects, place concrete in units bounded by construction joints shown in Shop Drawings. Placement shall occur such that each unit shall cure at least 7 days for hydraulic structures and 3 days for all other structures before contiguous units are placed, except corner sections of vertical walls shall not be placed until the 2 adjacent wall panels have cured at least 14 days for hydraulic structures and 7 days for all other structures.
- K. Provide sufficient illumination in interior of all forms so concrete at places of deposit is visible from deck or runway.
- L. Schedule concrete placement during evening or morning hours or provide ice or pre-cooled aggregate as needed to maintain temperature of concrete within the following ranges immediately before placement.
 - 1. Concrete less than 12" thick: 55°F to 90°F
 - 2. All other concrete: 50°F to 90°F
 - 3. When concrete temperature exceeds 80°F, only set retarding admixtures shall be used.
 - 4. When concrete temperature exceeds 85°F, time between introducing cement to aggregates and discharge shall not exceed 45 minutes.
 - 5. No additional compensation will be made to contractor for measures used to maintain concrete temperature within specified limits.
- M. Hot weather placement shall proceed as follows:
 - 1. Comply with ACI 305.
 - 2. From initial placement through curing, protect concrete from adverse effects of high temperature, low humidity and wind.
- N. All ends of chutes, hopper gates, and all other points of concrete discharge shall be arranged so concrete passing from them will flow continuously into receiving vessel without separation. Conveyor belts, if used, shall be wiped clean by device operated

so mortar adhering to belt is not wasted and shall be of type acceptable to Owner's Representative. Chutes shall be no longer than 50' long. Slopes of chutes shall permit free and continuous flow of concrete being placed.

3.2 INSTALLATION/APPLICATION

- A. Furnish and install concrete at locations shown on Plans and Submittals.
- B. The following installation standards shall be followed:
 - 1. Manufacturer's installation and warranty requirements
 - 2. Applicable OSHA and Cal OSHA regulations
 - 3. California Building Code Chapter 19 "Concrete"
 - 4. ACI 301 Structural Concrete for Buildings Chapter 8.
 - 5. ACI 318 Building Code Requirements for Reinforced Concrete
 - 6. Standard Specifications for Public Works Construction Section 303 "Concrete and Masonry Construction."
- C. Where hydrophobic waterproofing admixtures are added, admixture Manufacturer's installation and warranty requirements shall also be followed.
- D. Refer variances between above documents and Contract Documents to Owner's Representative.
- E. Pumping of concrete will only be permitted if satisfactory end results are obtained.
 - 1. For redundancy, provide standby pump on site or provide pumping equipment with two cylinders, designed to operate with one cylinder only.
 - 2. Replace pumping equipment or hoses that fail to function properly.
 - 3. Minimum diameter of hose and conduits shall be in accordance with ACI 304
 - 4. Do not use aluminum conduits to convey concrete.
 - 5. Concrete samples for slump, air content and test cylinders will be taken at placement (discharge) end of line.
- F. Do not drop concrete through reinforcing steel or into any deep form, nor place concrete in any form in manner permitting accumulation of mortar on surfaces above placed concrete. If necessary, use hoppers or vertical ducts of canvas, rubber or metal to convey concrete to place of final deposit without separation or splashing. Free fall shall not exceed 4' below ends of ducts, chutes or buggies except in column forms. In no case shall concrete be displaced horizontally in forms by more than 6' after depositing. Deposit concrete in uniform horizontal layers not deeper than 2'. Avoid inclined layers or inclined construction joints except where required for sloping

members. Place each layer while previous layer is still soft. Rate of placement in forms shall not exceed 5 vertical feet of rise per hour.

- G. Thrust blocks shall be placed behind all non-welded, non-flanged or non-restrained valves, fittings, reducers, tees, crosses, bends and dead ends. Place thrust blocks as follows:
1. Wrap fittings and valves, leaving stainless steel bolts exposed. Do not allow concrete to contact flanges or bolts.
 2. Owner's Representative shall inspect formwork and be present throughout placement of concrete.
 3. Unless otherwise shown on Plans, provide bearing surface not less than 3 times pipe diameter in all directions.
 4. Thrust block shall bear against undisturbed soil.
 5. In soft or disturbed soil, increase bearing surface as directed by Owner's Representative.
- H. Concrete in ramps and sloping slabs shall be placed uniformly from bottom to top for full width of placement. As work progresses, vibrate concrete and carefully work it around reinforcement. Screed ramp surface in an up-slope direction.
- I. Thoroughly settle, compact and consolidate concrete in forms or excavations throughout entire depth of concrete layer being placed.
1. Consolidate concrete into dense, homogeneous mass, filling all corners and angles, thoroughly embedding reinforcement and embedments, eliminating all rock pockets and bringing only a slight excess of water to exposed concrete surface during placement.
 2. Vibrators shall be Group 3 per ACI 309. Use high-speed power vibrators (8,000 rpm to 12,000 rpm) of immersion type in sufficient number and with (at least one) standby units as required to accomplish specified results within 15 minutes after concrete is deposited. Group 2 vibrators may be used only at specific locations when accepted by Owner's Representative.
 3. When placing concrete around waterstops, carefully rod and vibrate concrete to eliminate all air and rock pockets. Where flat-strip waterstops are placed horizontally, work concrete under waterstops by hand, making sure all air and rock pockets are eliminated. Concrete surrounding waterstops shall receive additional vibration over and above that used for adjacent concrete to assure complete embedment of waterstops in concrete.
 4. Concrete in walls shall be internally vibrated and at same time, rammed, stirred, or worked with suitable appliances, tamping bars, shovels, or forked tools until it completely fills forms or excavations and closes snugly against all surfaces. Do not place subsequent layers of concrete until previously

placed layers have been worked thoroughly as specified. Keep vibrating head from contact with form surfaces.

5. Do not vibrate concrete excessively or work it in any manner causing segregation of its constituents.
- J. Horizontal surfaces of concrete shall be level whenever run of concrete is stopped. To ensure level, straight joint on exposed surfaces of walls, tack wood strip at least 3/4" thick to forms on these surfaces. Carry concrete about 1/2" above underside of strip. About one hour after concrete is placed, remove wood strip. Using trowel, remove irregularities in edge formed by strip, and remove all laitance.
- K. Concrete finishing shall proceed as follows:
1. As soon as forms are removed, examine all exposed surfaces and rub or grind all fins, bulges or ridges in satisfactory method to provide smooth, uniform and continuous surface.
 2. Do not plaster or coat surfaces to be smoothed.
 3. Do not use aluminum finishing tools.
 4. Finished surfaces shall present finished, smooth, continuous hard surface.
 5. Tolerances of finished concrete shall be as shown in Section 03 10 00.
 6. Owner's Representative will inspect finished surface for voids, holes, honeycombing, rock pockets or similar depression defects. Damage shall be repaired as specified.
 7. Repair surface defects within 2 hours of form removal.
 8. Surface defect repairs that cannot be made within 2 hours following form removal shall be delayed until after curing compound has been applied. In such case, area involved shall then be wet sandblasted to remove curing compound following which repairs shall be made as specified, and curing compound shall be reapplied over repaired area.
- L. Repair defective work at Contractor's expense as follows:

SURFACE DEFECTS	
DEFECT	REPAIR METHOD
Tie Rod Cone Holes	Ream circular holes with suitable toothed reamers to leave surfaces of holes clean and rough. Do not ream rectangular holes or holes deeper than their least surface dimension. Repair holes in approved manner with dry-packed cement grout.
Cracks in Retaining Walls and Walls in Contact with Backfill	Apply waterproofing membrane to cover fill side of wall. or Vee cracks on water-bearing face with suitable tools. Fill with construction joint sealant designed for water-bearing structures
Cracks in Water-bearing Structures	Vee cracks on water-bearing face with suitable tools. Fill with construction joint sealant designed for water-bearing structures.
Minor Voids, Holes	Cut back from trueline at least 1/2" over entire area. Use chipping and cutting tools as

SURFACE DEFECTS	
DEFECT	REPAIR METHOD
or Honeycombing	needed. Do not feather edges. Remove 1/32" of surface film from hardened and cured portions by wet sandblast. Remove all laitance or soft material before bonding. Moisten exposed surface but do not wet it enough to overcome suction needed for bond. Mix for repair shall be 1 sack cement to 3 cubic feet sand with Atlas white Portland cement added as needed on interior walls to make patch match finish. Apply bonding agent if required. Apply repair mix.
HOLES EXTENDING THROUGH CONCRETE	
DEFECT	REPAIR METHOD
Small Holes less than 12" in least dimension	Fill hole with non-shrink grout. Where face of repaired surface is exposed to view, hold grout back 2" from finished surface. Patch remaining 2" as described above for "Minor Voids, Holes or Honeycombing." For water bearing structures, apply bentonite or other accepted waterstop material around perimeter of hole.
Large Holes greater than 12" in least dimension	Chip keyway into edge of opening. Repair keyed opening as described above for "Small Holes."
Large Holes greater than 24" in least dimension	Chip keyway into edge of opening If reinforcing is not present, dowel and epoxy reinforcing of size matching reinforcing in existing wall across opening in both directions. Repair keyed and reinforced opening as described above for "Small Holes."

M. Perform all repairs using approved methods that do not disturb bond or cause sagging or horizontal fractures. Finished surfaces shall be cured using methods and duration similar to that for adjacent concrete.

N. Concrete finishing of unformed surfaces shall proceed as follows:

1. After proper and adequate vibration and tamping, bring unformed surfaces of slabs, floors, walls and curbs to uniform surface with suitable tools.
2. Screed concrete and then immediately treat with liquid evaporation retardant. Reuse retardant as needed after each operation to prevent drying shrinkage cracks.
3. Classes of unformed surfaces shall be as follows:

FINISH	LOCATION	DESCRIPTION
U1 (screeded finish)	Grade slabs and foundations to be covered with concrete or fill material	Sufficient leveling and screeding to produce even, uniform surface with surface irregularities not exceeding 3/8". No further special finish.
U2 (float finish)	Floors to be covered with grouted tile or topping grout Slabs to be covered with built-up Roofing	After sufficient stiffening of concrete, float finish surface with wood or metal floats or with finishing machine using float blades. Do not excessively float surfaces while concrete is plastic. Floating shall be minimum necessary to produce uniform-texture surface free from screed marks. Do not dust dry cement or sand on concrete surface to absorb excess moisture. Surface irregularities shall not exceed 1/4" ..

FINISH	LOCATION	DESCRIPTION
U3 (steel trowel finish)	Interior slabs to receive architectural finish Top surface of walls Water-bearing slabs with slopes of 10% or less	After floated finish U2 hardens sufficiently to prevent excess of fine material from being drawn to surface, steel trowel surface with firm pressure to flatten sandy texture of floated surface and produce dense uniform surface free from blemishes, ripples and trowel marks. Finish shall be smooth and free from all irregularities.
U4 (hairbroom finish)	Non water-bearing slabs Water bearing slabs with slopes >10%	After completing steel trowel finish U3, add light hairbroom finish with brooming perpendicular to drainage unless otherwise shown. Resulting surface shall be rough enough to provide nonskid finish.

O. Do not backfill against walls until concrete has obtained 100% of specified 28-day compressive strength.

P. Concrete curing shall proceed as follows:

SURFACE	DESCRIPTION
Unstripped Forms	Method 1: Wet wood forms completely after concrete has been placed, and keep wet with water until forms are removed. For steel forms, keep exposed concrete surfaces continuously wet until forms are removed. If forms are removed within 14 days of placing concrete, continue curing as described for surfaces with forms removed
Construction Joints between Footings & Walls & between Floor Slab & Columns	Method 2: Cover surface with burlap mats. Wet mats with water for duration of curing period until concrete in walls has been placed. Do not apply curing compound to these surfaces.
Encasement Concrete & Thrust Blocks	Method 3: Cover surface with moist earth 4 to 24 hours after concrete is placed. Earthwork operations that may damage concrete shall not begin until at least 7 days after concrete is placed.
Concrete Surfaces not Described Elsewhere	Method 4: As soon as concrete hardens enough to prevent marring on unformed surfaces, and within 2 hours after form removal, spray surface with liquid curing compound in accordance with Manufacturer's application instructions. Cover no more than 200 square feet of surface per gallon with uniform film that seals thoroughly. Do not damage seal during curing. If seal is damaged or broken, apply additional curing compound over damaged portion. Where curing compound is accidentally applied to surfaces against which concrete is to be subsequently placed, remove curing compound by wet sandblasting just before placing new concrete. Where concrete is placed adjacent to panel coated with curing compound, apply curing compound to all previously coated panel areas within 6' of joint and apply to any other location where curing membrane is disturbed. Following curing, remove all visible traces of curing compound in such manner that surface finish is not damaged.
Floor Slabs on Grade	Method 5: Before curing medium is applied, keep entire surface damp using nozzles that atomize flow so surface is not marred or washed. Apply curing material using Method 4 described above. After 1 hour but not more than 4 hours have elapsed after applying curing material, wet surface with water delivered through fog nozzle. Place concrete curing blankets on slab, with edges butted together and with joints between strips sealed with 2" wide strips of sealing tape or with edges lapped at least 3" and fastened with waterproof cement to form continuous watertight joint. During first 3 days of curing, no traffic and no depositing of materials shall be permitted on curing blankets. After 3 days, any traffic or material deposits shall only occur on top of 5/8" minimum plywood sheets laid over curing blankets. Leave curing blankets in place for 14 days. Add water under curing blanket as often as necessary to maintain damp concrete surfaces. Do not remove curing blankets

SURFACE	DESCRIPTION
	until after concrete for adjacent work has been placed. Should curing blankets tear or become damaged, replace damaged sections.
Surfaces with Forms Removed & Slabs not on Grade	<p>Keep concrete continuously wet by applying water for at least 14 consecutive days beginning immediately after concrete reaches final set or after forms are removed. Before curing medium is applied, keep entire surface damp using nozzles that atomize flow so surface is not marred or washed.</p> <p>Use heavy curing mats secured in place with weights along all edges to continuously retain moisture during curing period. Use sprinklers or other means to maintain moist surface condition during and after normal working hours.</p> <p>At end of curing period, remove curing medium. Rewet any dry spots and apply curing compound in accordance with Method 4 above.</p>

Q. Excess curing water shall be disposed of in manner that avoids damage to Work.

R. Concrete finishing of formed surfaces shall proceed as follows:

1. Repair surface defects.
2. Immediately after stripping forms, inspect concrete surface. Repair all poor joints, voids, rock pockets and other defective areas.
3. Fill form tie holes as directed in Section 03 10 00.

3.3 FIELD QUALITY CONTROL

- A. Field testing and inspection of formwork shall be per Section 03 10 00.
- B. Field testing and inspection of steel reinforcement shall be per Section 03 20 00.
- C. CBC Chapter 17 special inspection shall only be required for Class AA "premium" concrete, Class A "structural" concrete and concrete having specified compressive strength f'_c exceeding 2500 psi.
- D. Maintain placing record on-site showing time and date of placement of all concrete having specified compressive strength f'_c exceeding 2500 psi as required in CBC Section 1704.4.2.
- E. Special inspection and field testing of Class AA and Class A concrete required by Chapter 17 of CBC (Table 1704.4) shall be completed by ICBO-certified special inspector selected by Owner and shall include:

ITEM	TEST FOR	TEST STANDARD (ASTM OR OTHER TEST STANDARD)	FREQUENCY	FIRST TEST PAID FOR BY	RETESTS PAID FOR BY
Class AA Concrete, Class A Concrete and Concrete having f'_c	Design Mix Verification	ACI 318, Ch 4 & 5.2-5.4, CBC 1904.25.25, 1913.2, & 1913.3	Periodic per CBC Table 1704.4	Owner	Contractor to reimburse Owner for costs of first deputy inspector if
	Slump	ACI 318 Sec. 5.6& 5.8, ASTM C31, ASTM C172 & CBC 1913.10 Slump per ASTM C143	Continuous per CBC Table 1704.4 taken at at ¼ point and ¾ point of		

ITEM	TEST FOR	TEST STANDARD (ASTM OR OTHER TEST STANDARD)	FREQUENCY	FIRST TEST PAID FOR BY	RETESTS PAID FOR BY
exceeding 2500 psi	Air Content	ACI 318 Sec. 5.6& 5.8, ASTM C31, ASTM C172 & CBC 1913.10 Air content per ASTM C173 or C231	batch and at time fresh concrete is sampled to fabricate cylinders for strength tests		re-inspection is required
	Temperature	ACI 318 Sec. 5.6& 5.8, ASTM C31, ASTM C172 & CBC 1913.10			
	Proper Placement of Concrete	ACI 318 Sec. 5.9-5.10, CBC 1913.6, 1913.7,& 1913.8	Continuous per CBC Table 1704.4		
	Verification of In-situ Concrete Strength Prior to Removal of Shores and Forms	ACI 318, Sec. 6.2 See below for concrete strength test requirements	Periodic per CBC Table 1704.4		
	Curing Temperature and Techniques	ACI 318, Sec. 5.11-5.13, & CBC 1913.9	Periodic per CBC Table 1704.4		
Shotcrete	Proper Application	ACI 318 Sec. 5.9-5.10, CBC 1913.6, 1913.7,& 1913.8	Continuous per CBC Table 1704.4 (Applies to reservoir only)		

F. Additional field testing of concrete shall include:

ITEM	TEST FOR	TEST STANDARD (ASTM OR OTHER TEST STANDARD)	FREQUENCY	FIRST TEST PAID FOR BY	RETESTS PAID FOR BY
Concrete Compressive Strength f_c	Trial Batch	1 st 3 cylinder tests at 7 days 2 nd 3 cylinder tests at 28 days average compressive strength at 28 days shall exceed 125% of specified compressive strength f_c	3 drying shrinkage samples and 6 compression test cylinders for each class or mix of concrete used	Contractor	Contractor
	Cylinder Sampling	ASTM C172	Sample each 100 cy concrete and each separate mix design placed on any day	Contractor	Contractor
	Cylinder Testing of Compressive Strength f_c	Field Cylinders per ASTM C31 Section 9.2 Laboratory Cylinders per ASTM C192	Make six 6" diameter x 12" high cylinders per 100 cy	Owner	Contractor

ITEM	TEST FOR	TEST STANDARD (ASTM OR OTHER TEST STANDARD)	FREQUENCY	FIRST TEST PAID FOR BY	RETESTS PAID FOR BY
		Testing per ASTM C39 Average of two cylinders	concrete and separate mix design placed on any day		
		Evaluation per ACI 214 & ACI 318 Chapter 5 "Concrete Quality"			
		Standard deviation of test results shall not exceed 640 psi.	1 st test at 7 days 2 nd test at 28 days		
			Save remaining cylinders to verify test results as directed.		
	Test Core Testing of Compressive Strength f'_c	Take test cores per ASTM C42 if minimum strengths fall below those specified.	3 cores per test as directed	Contractor	Contractor
		Concrete tested by coring shall be acceptable if average f'_c of 3 cores equals 85% of specified f'_c and no single core strength is less than 75% of specified f'_c			
Concrete	Flexural Strength	ASTM C78	As directed	Contractor	Contractor
	Unit Weight Yield	ASTM C138	As directed	Contractor	Contractor
	Drying Shrinkage	California Test 530	As directed	Contractor	Contractor
Mortar	Setting of Mortar	ASTM C191 or C266	As directed	Contractor	Contractor
	Mortar Cube Test	California Test 515	As directed	Contractor	Contractor
Concrete Finishing	Dimensional Tolerance	ACI 117 and Section 03 10 00	Inspection at Owner's discretion	Owner	Owner
	Surface Defects	Holes larger than 1/2" diameter or greater than 1/4" deep are defined as surface defects. More stringent requirements exist for some specified finishes.	As directed	Owner	Owner
	Permeability and Cracking in Water- Bearing Structures	Section 03 08 50	As directed	Owner	Owner
	Cracking in Flatwork and	No cracks wide enough to stick a dime in except at	As directed	Owner	Owner

ITEM	TEST FOR	TEST STANDARD (ASTM OR OTHER TEST STANDARD)	FREQUENCY	FIRST TEST PAID FOR BY	RETESTS PAID FOR BY
	Non-Water-bearing Structures	expansion or contraction joints.			
Concrete	11-month Warranty Inspection	Demonstrate compliance to Contract Documents and Manufacturer's printed literature	1 test	Owner	Contractor

- G. Concrete samples for batch testing shall be furnished in steel drums at no cost to Owner.
- H. In lieu of trial batch testing, Contractor may submit previously designed, tested and successfully used concrete mixes using materials similar to those intended for this project, together with at least 3 certified test reports of 28-day strength of proposed concrete mix.
- I. Laboratory used for field testing shall meet or exceed requirements of ASTM C1077.
- J. Contractor shall provide concrete for testing at no charge to Owner, and shall assist Owner's Representative and laboratory personnel in obtaining samples, and disposal and cleanup of excess material.
- K. Statistical analysis of compression test results will be performed according to ACI 214. Standard deviation of test results shall not exceed 640 psi when ordered at equivalent water content as estimated by slump. When said standard deviation exceeds 640 psi, increase average strength for which mix is designed as needed to satisfy statistical requirement that
 - 1. Probability of any test being more than 500 psi below specified strength < 1%.
 - 2. Probability of average of any 3 consecutive tests being below specified strength < 1%.

Required average strength shall be calculated using Criterion Number 3 of ACI 214 using actual standard deviation.
- L. All concrete which fails to meet ACI requirements and these Specifications is subject to removal and replacement at no increase in cost to Owner.
- M. In lieu of removing and replacing slightly deficient concrete having 85% or more of specified strength, Owner may, at their sole discretion, elect to reduce payment due to Contractor for substandard concrete as described in Caltrans Standard Specification Section 90-9 "Compressive Strength."

3.4 CLEANING

- A. Wash out chutes, shovels, finishing trowels and all other equipment that has been in contact with wet concrete at a designated concrete washout area.
- B. Do not discharge or deposit wet concrete, debris, or other concrete washout effluent on bare ground, on area tributary to storm drain or natural channel or in any storm drain facility.
- C. Dispose of concrete and concrete waste in accordance with all pollution prevention laws and regulations.

3.5 PROTECTION

- A. Protect all concrete against injury until final acceptance by Owner.
- B. Fresh concrete shall be protected from damage due to impact, overstress, vandalism and weather, including precipitation or extremes in temperature or humidity until final acceptance.
- C. Any new concrete not complying with these specifications shall be repaired or removed and replaced prior to final acceptance except where Owner agrees to reduce payment as described above.

**** END OF SECTION ****

**SECTION 03 60 00
GROUTING**

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Materials, testing, and installation of dry-pack grout, cement grout, non-shrink grout, epoxy grout and pressure grouting.

1.2 RELATED WORK

- A. Section 01 30 00: Contractor Submittals
- B. Section 01 40 00: Quality Control
- C. Section 01 53 00: Protection of Existing Facilities
- D. Section 01 55 00: Site Access and Storage
- E. Section 01 60 00: Products, Materials, Equipment and Substitutions
- F. Section 03 30 00: Cast-in-Place Concrete
- G. Section 05 50 00: Metal Fabrications

1.3 SYSTEM DESCRIPTION

- A. Furnish and install complete grouted system with applicable embedments, including appurtenant structural, mechanical, and/or electrical mountings or connections required for compliance with Manufacturer's installation requirements and compliance with applicable building codes and standards.

1.4 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workmen trained and experienced in necessary trades and crafts and completely familiar with specified requirements and methods for proper performance of Work of this section.

- B. Plant testing of aggregate shall include:

ITEM	TEST FOR	TEST STANDARD (ASTM OR OTHER TEST STANDARD)	FREQUENCY	FIRST TEST PAID FOR BY	RETESTS PAID FOR BY
Aggregate	Sieve Analysis	ASTM C136	1 each trial batch	Owner	Contractor
	Amount passing #200 sieve	ASTM C117	1 each trial batch	Owner	Contractor
Fine Aggregate	Sand Equivalent	ASTM D2419	As directed	Owner	Contractor
	Organic Impurities	ASTM C40	As directed	Owner	Contractor
	Soundness	ASTM C88	As directed	Owner	Contractor

C. Plant testing shall include:

ITEM	TEST FOR	TEST STANDARD (ASTM OR OTHER TEST STANDARD)	FREQUENCY	FIRST TEST PAID FOR BY	RETESTS PAID FOR BY
Concrete	Certification of Mix Design	ACI 301 certified by independent testing laboratory	1 per mix	Contractor	Contractor
Grout Materials	Materials Inspection	See Paragraph 2.2 below	As directed	Owner	Owner

1.5 REFERENCES

- A. ASTM C33 - Concrete Aggregate.
- B. ASTM C40 - Organic Impurities in Sand for Concrete.
- C. ASTM C88 - Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate.
- D. ASTM C117 - Materials Finer than No. 200 Sieve in Mineral Aggregates by Washing.
- E. ASTM C136 - Sieve or Screen Analysis of Fine and Course Aggregates.
- F. ASTM C150 - Portland Cement.
- G. ASTM C494 - Chemical Admixtures for Concrete.
- H. ASTM C1107 - Packaged Dry, Hydraulic-Cement Grout (Non-Shrink).
- I. ASTM D695 - Compressive Properties of Rigid Plastics.
- J. ASTM E329 - Recommended Practice for Inspection and Testing Agencies for Concrete, Steel, and Bituminous Materials as Used in Construction
- K. California Test No. 217 - Sand Equivalent
- L. California Building Code (CBC)

1.6 SUBMITTALS

A. Furnish the following submittals.

SUBMITTAL	DESCRIPTION
Catalog Data	Product data required for bonding compounds, non-shrink grout, epoxy grout and water reducing retardant per catalog data requirements.
Installation Instructions	Required per installation or application instruction requirements.
Certificate of Compliance	Submit mill test certification including fineness for each shipment of cement per ACI 301.
	Submit aggregate gradation and certification per ACI 301.
	Submit admixture certification including chloride ion content per ACI 301.
	At least 24 hours before placing concrete, submit certification from each trade having embedded items in concrete to be placed stating that embedded items for each trade are properly located, placed and braced and that equipment pads are properly sized.
Warranty	Furnish one-year warranty from date of final acceptance

B. Refer to Section 01 30 00 for definition of requirements for catalog data, installation instructions, and certificates of compliance.

- C. When sources of aggregate are changed, a new certification shall be provided for new material prior to its use.

1.7 DELIVERY, STORAGE AND HANDLING

- A. Refer to contract documents for delivery storage and handling requirements.
- B. Manufacturer’s instruction and warranty requirements for delivery, storage and handling of grout shall be strictly followed.

1.8 PAYMENT

- A. Payment for Work in this section shall be included as part of the lump-sum for Bid Item No. 1.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Acceptable manufacturers include:

ITEM	MANUFACTURER	MANUFACTURER LOCATION
Bonding Agent (Noncorrosive)	Concreive Div BASF	Freeport, TX
	Edoco	Kansas City, KS
	Master Builders Inc.	Cleveland, OH
	Sika Corporation "Armatec 110 EpoCem"	Lyndhurst, NJ
	Accepted equal	
Lubricant for Cement Pressure Grouting	Intrusion Prepakt Intrusion Aid	
	Sika Corporation Intraplast	Lyndhurst, NJ
	Accepted equal	
Non-Shrink Grout	Masterflow "713"	
	Sika Corporation "Sikagrout 212"	Lyndhurst, NJ
	Sika Corporation "Sika Top 123 Plus"	Lyndhurst, NG
	Accepted equal	
Water Reducing Retarder	Plastocrete "161MR"	
	Sika Corporation "Plastiment"	Lyndhurst, NJ
	Accepted equal	

2.2 MATERIALS

- A. Refer to Section 01 60 00 for basic requirements for products and materials.
- B. Grout shall be constructed of the following materials:

ITEM	MATERIAL	SPECIFICATION
Cement	Portland Cement	ASTM C150 Type II/V Modified Low Alkali/Sulfate Resisting, including Table 2 optional requirements At least 85% of cement by weight shall pass a 325 screen Low Alkali containing maximum 0.60% alkalis
Water	Clean, Clear Potable Water	TDS<1000 mg/l
Aggregate	All Aggregate	ASTM C33 Nonreactive clean hard durable washed material

ITEM	MATERIAL	SPECIFICATION		
		From pits acceptable to Owner's Representative Ratio of silica released to reduction in alkalinity <1.0 Ratio of fine aggregate to total aggregate shall be <41% for hydraulic structures and <50% for all other structures.		
	Fine Aggregate	Natural sand, manufactured sand or combination Sand Equivalent not less than 75% average for 3 samples or less than 70% for any one sample. Gradation – well graded per ASTM C33 100% passing #8 sieve 45% or more passing #40 sieve 3% max passing #200 sieve Variation will be accepted if average of 3 consecutive tests falls within limits and variation does not exceed the following: Sieves #30 or coarser - 2.0% maximum variation Sieves #50 or finer - 0.5% maximum variation Soundness – 10% maximum loss with sodium sulfate Fineness modulus – <3.00		
Admixtures	All Admixtures	Compatible with grout Conform to ASTM C494 Do not use admixtures containing calcium chloride Use admixtures in accordance with Manufacturer's recommendations Add admixtures separately to grout mix		
	Fly Ash	Not permitted		
	Water Reducing Retarder	ASTM C494 Type D		
Bonding Agent		Epoxy resin with anti-corrosive properties		
Grout	Dry-Pack Grout	Proportions (parts by volume)	1 part cement 2 parts fine aggregate Water reducing retarder Sufficient water to make stiff workable mix.	
	Cement Grout	Proportions (parts by volume)	1 part cement 2 parts fine aggregate Pressure grouting admixture Sufficient water to make stiff workable mix.	
	Non-shrink Grout	f'_c	6000 psi	
		Non-metallic, free-flowing, cement-based grout Conform to ASTM C1107		
	Epoxy Grout	f'_c	8000 psi	
		Solvent-free, high-strength, high-flow 100% solids grout		

PART 3 - EXECUTION

3.1 PREPARATION

- A. Make field measurements needed to install grout before submitting shop drawings or ordering. Make minor changes in dimensions and alignments as needed to avoid utilities or structural conflicts.

- B. Do not place grout in freezing weather unless adequate protection is provided in accordance with Manufacturer's recommendations.
- C. Apply bonding agent to existing surfaces before applying grout or mortar.
- D. Holes required for grouting shall be blown clean. Drill horizontal holes for grouting at a slight downward angle to facilitate holding grout until setting is complete. Slightly bend bolts or reinforcing steel installed in horizontal grout holes accordingly.

3.2 INSTALLATION

- A. Furnish and install grout at locations shown on Plans and Submittals.
- B. The following installation standards shall be followed:
 - 1. Manufacturer's installation and warranty requirements
 - 2. Applicable OSHA and Cal OSHA regulations
 - 3. Applicable building code requirements
- C. Refer variances between above documents and Contract Documents to Owner's Representative.
- D. Install grout to tolerances recommended by Manufacturer. Unless otherwise shown, install grout true and level using precision gauges and levels.
- E. Dry-pack grout shall be installed as follows:
 - 1. Use dry-pack grout for built-up surfaces, setting miscellaneous metal items and minor repairs.
 - 2. Roughen surfaces required to be built up with dry-pack grout by brushing, cleaning, and coating with bonding agent specified in this section before applying grout.
 - 3. Apply dry-pack grout immediately after applying bonding compound. Apply grout in bands or strips to form a smooth covering of required thickness.
 - 4. Slope construction joints in grout. Clean and wet construction joints before resuming application.
 - 5. Cure dry-pack grout in accordance with Section 03 30 00.
- F. Cement grout shall be installed as follows:
 - 1. Use cement grout for filling nonbearing portions of equipment pads and pressure grouting.
 - 2. Except for specialized equipment for pressure grouting, mixing and placing apparatus shall be similar to that normally used for cast-in-place concrete.

3. Mix grout for at least one minute. Agitate diluted grout to keep ingredients mixed.

G. Non-shrink grout shall be installed as follows:

1. Use non-shrink grout for bearing surfaces of machinery and equipment bases, column baseplates and bearing plates, and for setting bolts and reinforcing steel in holes for grouting.
2. Place non-shrink grout in accordance with grout Manufacturer's instructions.

H. Pressure grout shall be installed as follows:

1. Pressure grouting equipment shall include a mixer and holdover agitator tanks and shall be designed to place grout at pressures up to 50 psi. Provide gages to indicate pressure used. Provide mixer with meter capable of indicating grout volume used to ± 0.10 cubic feet.
2. Prior to grouting, wash systems and holes to be grouted. Washing is not required for grouting soil voids outside pipe cylinders or casing pipes.
3. Complete grouting without stoppage once grouting commences. If equipment breaks down, wash out grouting system sufficiently to ensure fresh grout and adequate bond and penetration occur upon restarting grouting.
4. Maintain grout pressure until grout has set.

3.3 FIELD QUALITY CONTROL

A. Field testing shall include:

ITEM	TEST FOR	TEST STANDARD (ASTM OR OTHER TEST STANDARD)	FREQUENCY	FIRST TEST PAID FOR BY	RETESTS PAID FOR BY
Cement Grout Mix	Material Properties	ASTM C1019	2 samples per day	Contractor	Contractor
	Installation & Leakage	Visual inspection of finished installation	1 inspection	Owner	Owner
	Field Performance	Demonstrate compliance to Contract Documents and Manufacturer's printed literature	1 test	Contractor	Contractor
	11-month Warranty Inspection	Demonstrate compliance to Contract Documents and Manufacturer's printed literature	1 test	Owner	Contractor

**** END OF SECTION ****

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**SECTION 05 50 00
METAL FABRICATIONS**

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Materials, testing, and installation of metal fabrications, including concrete anchor bolts, and formed metal fabrications.

1.2 RELATED WORK

- A. Section 01 30 00: Contractor Submittals
- B. Section 01 40 00: Quality Control
- C. Section 01 53 00: Protection of Existing Facilities
- D. Section 01 55 00: Site Access and Storage
- E. Section 01 60 00: Products, Materials, Equipment and Substitutions
- F. Section 03 30 00: Cast-in-Place Concrete
- G. Section 07 72 33: Floor Hatches

1.3 SYSTEM DESCRIPTION

- A. Furnish and install metal fabrications where shown including appurtenant mountings or connections required for compliance with Manufacturer's installation requirements and compliance with applicable building codes and standards.

1.4 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workmen trained and experienced in necessary trades and crafts and completely familiar with specified requirements and methods for proper performance of Work of this section.

1.5 REFERENCES

- A. ANSI/ASME B18.15 Forged Eyebolts
- B. ANSI AWS A2.4 Standard Symbols for Welding, Brazing and Nondestructive Examination
- C. API 9A Wire Rope
- D. ASSE 1060 Outdoor Enclosures for Backflow Prevention Devices
- E. ASTM A36 Carbon Structural Steel
- F. ASTM A123 Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
- G. ASTM A153 Zinc Coating (Hot-Dip) on Iron and Steel Hardware
- H. ASTM A167 Stainless and Heat-Resisting Chromium Nickel Steel Plate, Sheet, and Strip
- I. ASTM A193 Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature Service
- J. ASTM A194 Carbon and Alloy Steel Nuts for High-Pressure and High Temperature Service
- K. ASTM A325 Structural Bolts, Steel, Heat Treated 120/105-ksi Minimum Tensile Strength
- L. ASTM A413 Carbon Steel Chain

- M. ASTM A489 Carbon Steel Lifting Eyes
- N. ASTM A490 Heat-Treated Steel Structural Bolts 150ksi Minimum Strength
- O. ASTM B6 Zinc
- P. ASTM B633 Electrodeposited Coatings of Zinc on Iron and Steel
- Q. ASTM F541 Alloy Steel Eyebolts
- R. ASTM F593 Stainless Steel Bolts, Hex Cap Screws and Studs
- S. ASTM F594 Stainless Steel Nuts
- T. AWS D1.1 Structural Welding Code – Steel
- U. California Building Code (CBC)
- V. SSPWC Standard Specifications for Public Works Construction (Greenbook) Section 206 “Miscellaneous Metal Items”
- W. SSPWC Standard Specifications for Public Works Construction (Greenbook) Section 304 “Metal Fabrication and Construction”

1.6 SUBMITTALS

- A. Furnish the following submittals.

SUBMITTAL	DESCRIPTION	
Shop Drawings	Required for formed metal fabrications per structural shop drawing requirements	
Catalog Data	Required for all manufactured products per catalog data requirements.	
Installation Instructions	Required per installation instruction requirements	
Certificate of Compliance	Submit coating system and application certification per certificate of compliance requirements.	
Foundry or Test Record Transcripts	Submit for factory tests upon request per foundry or test record transcript requirements.	
Material Samples	Required on request	
Welder Qualification Certificates	Required for all welders performing work on this project. Also submit certifications of procedure qualifications for each welding procedure used.	
Warranty	Furnish one-year warranty from date of final acceptance	

- B. Refer to Section 01 30 00 for definition of requirements for shop drawings, catalog data, installation instructions, certificates of compliance, foundry or test records and material samples.

1.7 DELIVERY, STORAGE AND HANDLING

- A. Refer to contract documents for delivery, storage, and handling requirements.
- B. Manufacturer’s instruction and warranty requirements for delivery, storage and handling of metal fabrications shall be strictly followed.

1.8 PAYMENT

- A. Payment for Work in this section shall be included as part of the lump-sum for Bid Item No. 1.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Acceptable Manufacturers include:

ITEM	MANUFACTURER	MANUFACTURER LOCATION
Concrete Anchors – Epoxy Adhesive Anchor Systems	Hilti Corp.	Tulsa, OK
	ITW Ramset / Redhead	Wood Dale, IL
	Simpson Strong Tie Co. "Epoxy-Tie"	Pleasanton, CA
	Accepted Equal	
Manhole Covers – Cast Iron	Alhambra Foundry Company Ltd.	Alhambra, CA
	Long Beach Iron Works, Inc.	Long Beach, CA
	Neenah Foundry	Neenah, WI
	South Bay Foundry	National City, CA
	U S Foundry and Manufacturing Corp	Medley, FL
	Accepted equal	
Fabricated Metalwork	Desert Iron and Machine Works, Inc.	
	Accepted Equal	

2.2 MATERIALS

A. Refer to Section 01 60 00 for basic requirements for products and materials.

B. Bolts, anchors and welds shall be constructed of the following materials:

ITEM	MATERIAL	SPECIFICATION
Bolts (Connection Bolts, U-Bolts and Anchor Bolts) - Stainless Steel	Stainless Steel	Alternate ASTM F593 Type 316 bolts with ASTM F594 SAE Type 316 nuts Washers – same material as nuts
Concrete Anchors – Epoxy Adhesive Anchor Systems	Stainless Steel	AISI Type 316
Welding Electrode - Steel	Steel Electrodes	AWS D1.1 E70xx except E7024 rods or electrodes shall not be used

C. Metal shapes, members and manhole lids shall be constructed of the following materials:

ITEM	MATERIAL	SPECIFICATION
Plate and Sheet – Stainless Steel	Stainless Steel	ASTM A167 SAE Type 316
Structural Members including Rolled Shapes, Structural Steel Pipe and Structural Steel Tubing – Stainless Steel	Stainless Steel	SAE Type 316
Manhole Frames and Covers	Gray Cast Iron	ASTM A48 Class 35 Design for H-20 highway wheel loading Incorporate pick-hole for lifting purposes Castings with blisters, blowholes and shrinkage are not permitted.

ITEM	MATERIAL	SPECIFICATION
		Clean all castings. Grind and finish cover to fit in its frame without rocking.
	Coating	Dip twice in asphalt or coal tar and oil mixture at temperature between 290°F and 310°F to form firm and tenacious coating

PART 3 - EXECUTION

3.1 PREPARATION

- A. Make field measurements needed to fabricate and install metal fabrications before submitting shop drawings or ordering. Make minor changes in dimensions and alignments as needed to avoid utilities or structural conflicts.
- B. Clean surfaces of metalwork to be in contact with concrete, removing all rust, dirt, grease and other foreign substances before concrete is placed.
- C. Aluminum surfaces to contact concrete shall be coated with heavy alkali-resistant bituminous paint or one coat of zinc chromate.
- D. Aluminum surfaces to contact dissimilar metals shall be insulated from dissimilar metals using neoprene gaskets or washers.
- E. All embedded metalwork shall be secured accurately in position when concrete is placed to prevent displacement or undue vibration during or after placement of concrete.
- F. Concrete anchors not cast in place shall be installed in holes drilled or cored to dimensions shown in anchor Manufacturer's installation instructions.
- G. Where metalwork is to be installed in recesses in formed concrete, said recesses shall be made, metalwork installed, and recesses filled with dry-pack mortar in conformance with Division 3 Concrete.

3.2 INSTALLATION

- A. Furnish and install structural steel load-bearing systems at locations shown on Plans and Submittals.
- B. The following installation standards shall be followed:
 - 1. Manufacturer's installation and warranty requirements
 - 2. Applicable OSHA and Cal OSHA regulations
 - 3. California Building Code Chapter 22 "Steel"
 - 4. Other applicable building code requirements
 - 5. AWS B3.0 Welding Procedures and Performance Qualifications

6. AWS D1.1 Structural Welding Code – Steel
 7. AWS D1.3 Structural Welding Code - Sheet Steel
 8. AISC 360 Structural Steel Buildings
 9. SSPWC Standard Specifications for Public Works Construction (Greenbook) Section 304 “Metal Fabrication and Construction”
- C. Refer variances between above documents and Contract Documents to Owner’s Representative.
- D. Install structural steel load-bearing systems to tolerances recommended by Manufacturer and AISC standards. Unless otherwise shown, install structural steel load-bearing systems plumb, square, and level using precision gauges and levels.
- E. Protect dissimilar metals from galvanic corrosion using pressure tapes, coatings, or isolators.
- F. Flame-cutting of structural members using a gas-cutting torch will not be permitted except on non-structural members and then, only with written permission from Owner’s Representative.
- G. Structural assemblies and shop and field welding shall comply with AISC M011 and AISC S326.
- H. Welding shall comply with the 2015 Greenbook; specifically Section 304-1.9.
- I. Bolting shall be completed as follows:
1. Bolt holes shall be 1/16” larger than the nominal size of bolts. Where thick metals are indicated, holes shall be subpunched and drilled and reamed.
 2. Bolts shall not be permitted to drift and holes shall not be enlarged to correct misalignment. In the event of mismatching of holes, provide new materials.
 3. Drive bolts accurately into holes without damaging thread.
 4. Protect boltheads from damage during driving, and replace if damaged.
 5. Boltheads and nuts shall rest squarely against metal. Draw boltheads and nuts tight against work using suitable wrench not less than 15 inches long or a torque wrench set to provide a similar torque. Tap boltheads with hammer while nut is being tightened. After being tightened, nuts shall be locked.
 6. Bolts used on beveled surfaces having slopes greater than 1 in 20 with a plane normal to bolt axis shall be provided with beveled washers to provide full bearing of boltheads and nuts.

7. Where self-locking nuts are not furnished, bolt threads shall be upset to prevent nuts from backing off.
8. Bolts shall extend entirely through nut but not more than ¼ inch beyond outside face of nut.

3.3 FIELD QUALITY CONTROL

A. Field testing shall include:

ITEM	TEST FOR	TEST STANDARD (ASTM OR OTHER TEST STANDARD)	FREQUENCY	FIRST TEST PAID FOR BY	RETESTS PAID FOR BY
Metal Fabrications	No Bends, Twists or Open Joints No Projecting Edges or Corners at Intersections	Visual inspection	All metalwork	Owner	Owner
	Edge Distances and Spacings	Visual inspection and measurement per CBC Table 1911.2	All bolts	Owner	Owner
	Field Performance	Demonstrate compliance to Contract Documents and Manufacturer's printed literature	1 test	Contractor	Contractor
	11-month Warranty Inspection	Demonstrate compliance to Contract Documents and Manufacturer's printed literature	1 test	Owner	Contractor

**** END OF SECTION ****

**SECTION 07 72 33
FLOOR HATCHES**

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Materials, testing, and installation of a vault access hatch for the bypass pumping connection vault (located outside the lift station), and two water-tight and gas-tight wet well access hatches (floor doors) that are located inside the Pump Room.

1.2 RELATED WORK

- A. Section 01 30 00: Contractor Submittals
- B. Section 01 40 00: Quality Control
- C. Section 01 53 00: Protection of Existing Facilities
- D. Section 01 55 00: Site Access and Storage
- E. Section 01 60 00: Products, Materials, Equipment and Substitutions
- F. Section 03 30 00: Cast-in-Place Concrete
- G. Section 05 50 00: Metal Fabrications
- H. Section 09 90 00: Protective Coatings

1.3 SYSTEM DESCRIPTION

- A. Furnish and install complete operating floor hatch including appurtenant structural, mechanical and/or electrical mountings or connections required for compliance with Manufacturer's installation requirements and compliance with applicable building codes and standards.

1.4 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workmen trained and experienced in necessary trades and crafts and completely familiar with specified requirements and methods for proper performance of Work of this section.

1.5 REFERENCES

- A. California Building Code (CBC)
- B. California Fire Code (CFC)
- C. California Mechanical Code (CMC)

1.6 SUBMITTALS

- A. Furnish the following submittals.

SUBMITTAL	DESCRIPTION	
Shop Drawings	Required per structural shop drawing requirements.	
Catalog Data	Required per catalog data requirements.	
Installation Instructions	Required per installation instruction requirements. Include rough-in diagrams.	
O & M Instructions	Required per operation and maintenance instruction requirements	

SUBMITTAL	DESCRIPTION	
Warranty	Furnish one-year warranty from date of final acceptance	

- B. Refer to Section 01 30 00 for definition of requirements for shop drawings, catalog data, installation instructions, and O&M instructions.

1.7 DELIVERY, STORAGE AND HANDLING

- A. Refer to contract documents for delivery, storage, and handling requirements.
- B. Manufacturer's instruction and warranty requirements for delivery, storage and handling of floor hatches shall be strictly followed.

1.8 PAYMENT

- A. Payment for Work in this section shall be included as part of the lump-sum for Bid Item No. 1.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Acceptable Manufacturers include the following:

ITEM	MANUFACTURER	MANUFACTURER LOCATION
Traffic-Rated Hatch (for Bypass Pump Connection Vault); this hatch is subject to occasional H20 truck traffic loads.	MFR: USF FABRICATION (800.258.6873) Hatch #1: Model AHS (to provide 36"x 36" clear opening). This is the hatch associated with the Bypass Pump Connection Vault.	Hialeah, FL
	Accepted equal	
Water-Tight and Gas-Tight Hatches (to provide Wet Well access from the Pump Room). This hatch is subject to pedestrian loading from above, but hydrostatic pressure from below.	MFR: PRESRAY CORPORATION (800.431.3456) Hatch #2: Model D3HA (to provide 36"x 36" clear opening). This is the hatch at the north side of the Pump Room. Hatch #3: Model D3HA (to provide 36"x 36" clear opening). This is the hatch at the south side of the Pump Room.	Wassaic, NY
	Accepted equal	

2.2 GENERAL REQUIREMENTS FOR MATERIALS

- A. Refer to Section 01 60 00 for basic requirements for products and materials.

B. Floor hatches shall be constructed of the following materials:

ITEM	MATERIAL	SPECIFICATION
Hatch – Bypass Pump Connection Vault	Aluminum	
Hatches – Pump Room	Stainless Steel	SAE Type 316
Hatch Hardware	Stainless Steel	SAE Type 316

C. The following product design criteria, options and accessories are required:

ITEM	DESCRIPTION	
Hatch	Construction	See plans
	Size	See plans
	If Pedestrian-Rated Design Load	Minimum 300 psf design load (hatch is accessible only by pedestrians and light wheeled equipment common to pump station maintenance work.
	Gas-Tight / Water-Tight Design Load	Minimum 1,560 psf design load (from top of hatch) -plus- Maximum of 20 feet of unseating water head (assuming the wetwell is completely flooded.
	If Traffic-Rated Design Load	Frequent H ₂ O wheel loads (hatches are located in a parking lot that is accessible by cars or trucks)
	Maximum Deflection under Design Load	Span/150
	Lid Finish	1/4" Diamond Pattern Checker Plate
	Angle Frame	1/4" thick frame with anchor flange around perimeter.
	Gas Tight Design	Manufacture with elastomeric seals as recommended by the manufacturer, which will preclude sewage gas from leaking through the hatch frame and doors when they are securely and properly closed, and the worst case design load is occurring.
	Door Operator	Compression or Torsion Assist Spring Required
	Hold-Open Arm	Provide automatic hold open arm with release handle
	Safety Grate	Provide aluminum safety grate with OSHA safety orange finish
	Locking Hardware	Provide recessed pad-lockable hasp and heavy duty padlock keyed to Owner's requirements
Factory Finish for Aluminum Hatch	Mill finish with bituminous coating on aluminum frame exterior All interior, ferrous hatch surfaces (including all frame surfaces) shall be painted per Section 09 90 00 in conformance with the requirements for "Ferrous Metals, Buried Exterior".	

D. Hatch opening dimensions refer to clear opening space available without obstruction by any portion of the leaves, framing, reinforcement or attached

hardware except for spring operators which may occupy no more than a 2"x3" square area in each corner when the hatch doors are fully open. If Manufacturers' standard design does not provide such clear openings, then their standard design shall be modified as required to comply with the Contract Documents at no additional cost to the Owner.

- E. Gas Tight Requirements: The entire perimeter of each leaf in a designated gas-tight access hatch shall be sealed to preclude the escape of odorous gases from the space below for the design unseating head specified above. A resilient elastomeric seal as recommended by the hatch manufacturer shall be attached to the access hatch frame and doors. For double leaf doors, over-lapping double doors to compress a seal against a removable center support beam where the doors meet when closed is an acceptable design feature for the Owner. When each door is closed, the elastomeric seal (at all location) shall be compressed to create a low pressure gas tight seal. The seal and its retainer shall be an integral part of the access hatch frame and doors. Provide one or more three-point latching system(s) using cam-locks to compress the hatch leaf against the elastomeric seal (around the entire perimeter of the hatch) as required to achieve the gas tight performance described.
- F. The hatch frame shall also be gas-tight. Hatch components that are exposed to the wet well interior and are to be joined shall be made gas tight by welding the joint along its entire length to eliminate the paths for the escape of sewage odors.

The furnished hatch that complies with the gas-tight requirements specified herein may not be a standard product by manufacturers. Manufacturers can modify their standard product as required to meet these specifications.

2.4 DETAILED REQUIREMENTS FOR MATERIALS

- A. Hatch #1 (Single-Leaf Hatch for Bypass Pump Connection Vault): This access hatch (floor door) shall be rated for occasional AASHTO H20-44 loading. This hatch shall be fabricated from aluminum, and shall have 1/4-inch thick floor plate, lift assist, square bars, flat bars, channels, and angles. This hatch shall have an angle frame and shall be furnished with Type 316 stainless steel appurtenances (including but not limited to the following: hinges, tamper-proof fasteners, a flush water-tight handle, automatic hold-open arm with red vinyl grip and strap anchors welded to frame). Contractor shall confirm this hatch will provide the specified clear opening prior to fabrication. Hatch shall be easily operated (opened and closed) by one person.
- B. Hatch #2 (Single-Leaf Hatch for Pump Room Floor/Wet Well Access): This floor access hatch shall be designed for gas-tight and flood-tight service for the design loading conditions listed above. The cover is not located in a vehicular access area, and will be subject to 300 psf (pedestrian) and light wheeled equipment loading. However, additional hatch loading capacity shall be furnished as necessary to achieve the water-tight and gas-tight design requirements associated with hydrostatic forces from beneath the hatch. The hatch shall have camlock devices (or other type of mechanical system) to compress the hatch lid against the elastomeric gasket/seals that are constructed into the hatch frame, to achieve the required gas-tight and flood-tight service. This hatch shall be fabricated from Type 316 stainless steel, and shall have 1/4-inch thick floor plate, lift assist, square bars,

flat bars, channels, and angles. This hatch shall be furnished with Type 316 stainless steel appurtenances (including but not limited to the following: hinges, tamper-proof fasteners, a flush water-tight handle, automatic hold-open arm with red vinyl grip and strap anchors welded to frame). An elastomeric gasket (minimum 0.5-inch square) shall be furnished to provide the required sealing surface. Contractor shall confirm this hatch will provide the specified clear opening prior to fabrication. Hatch fabricator shall design the hatch frame where it bolts to the Pump Room floor, to resist upward forces associated with the specified maximum hydrostatic pressure from beneath the hatch, and shall recommend the required bolting (number, size and spacing of floor bolts) to resist those design forces. Hatch shall be easily operated (opened and closed) by one person.

The hatch design shall not have handles or other features that extend above the hatch door (when in the "closed position") that present a tripping hazard.

- C. Hatch #3 (Single-Leaf Hatch for Pump Room Floor/Wet Well Access): This floor access hatch shall be designed for gas-tight and flood-tight service for the design loading conditions listed above. The cover is not located in a vehicular access area, and will be subject to 300 psf (pedestrian) and light wheeled equipment loading. However, additional hatch loading capacity shall be furnished as necessary to achieve the water-tight and gas-tight design requirements associated with hydrostatic forces from beneath the hatch. The hatch shall have camlock devices (or other type of mechanical system) to compress the hatch lid against the elastomeric gasket/seals that are constructed into the hatch frame, to achieve the required gas-tight and flood-tight service. This hatch shall be fabricated from Type 316 stainless steel, and shall have 1/4-inch thick floor plate, lift assist, square bars, flat bars, channels, and angles. This hatch shall be furnished with Type 316 stainless steel appurtenances (including but not limited to the following: hinges, tamper-proof fasteners, a flush water-tight handle, automatic hold-open arm with red vinyl grip and strap anchors welded to frame). An elastomeric gasket (minimum 0.5-inch square) shall be furnished to provide the required sealing surface. Contractor shall confirm this hatch will provide the specified clear opening prior to fabrication. Hatch fabricator shall design the hatch frame where it bolts to the Pump Room floor, to resist upward forces associated with the specified maximum hydrostatic pressure from beneath the hatch, and shall recommend the required bolting (number, size and spacing of floor bolts) to resist those design forces. Hatch shall be easily operated (opened and closed) by one person.

The hatch design shall not have handles or other features that extend above the hatch door (when in the "closed position") that present a tripping hazard.

PART 3 - EXECUTION

3.1 PUMP ROOM FLOOR HATCHES

- A. Make field measurements needed to install floor hatches before submitting shop drawings or ordering. Make minor changes in dimensions and alignments as needed to avoid utilities or structural conflicts.
- B. Contractor shall demolish the existing manhole frame and cover assembly that is at hatch location. Contractor shall clear away debris and shall repair and patch the

floor surface as required to provide a smooth flat surface upon which the new gas-tight floor hatches can be mounted and achieve a gas-tight fit between the hatch frame and floor surface.

- C. The hatch frame will be bolted to the top of the floor surface at each floor opening location. Contractor shall furnish an elastomeric gasket of type and size (per hatch manufacturer's requirements) to place beneath the hatch frame as an additional feature to obtain a gas-tight installation.

3.2 INSTALLATION

- A. Furnish and install floor hatches at locations shown on Plans and Submittals.
- B. The following installation standards shall be followed:
 - 1. Manufacturer's installation and warranty requirements
 - 2. Applicable OSHA and Cal OSHA regulations
 - 3. Applicable building, fire, plumbing, and electrical code requirements
- C. Refer variances between the above documents and Contract Documents to Owner's Representative.
- D. Install floor hatches to tolerances recommended by Manufacturer. Unless otherwise shown, install floor hatches true and level using precision gauges and levels.
- E. Connect 1-1/2 inch stainless steel pipe to drains required on hatch frames to prevent ponding and extend to drain freely (note: this requirement pertains to hatches that have "channel-type frames that can retain water").
- F. Hatch shall be accurately and substantially positioned prior to placing concrete, such that the covers are flush with the slab surface. The hatch shall be protected from damage resulting from concrete placement. Exposed surfaces shall be thoroughly cleaned of all concrete spillage such that a clean, uniform appearance is achieved.
- G. Prior to setting frame and pouring concrete, Contractor shall confirm that the hatch and its operating mechanism do not conflict with removal of indicated equipment below, and does not impede use of the associated access ladder (should one be indicated). Should a conflict be discovered, Owner may authorize a change in hatch orientation or size to prevent such conflict.

3.3 FIELD QUALITY CONTROL

- A. Field testing shall include the following:

ITEM	TEST FOR	TEST STANDARD (ASTM OR OTHER TEST STANDARD)	FREQUENCY	FIRST TEST PAID FOR BY	RETESTS PAID FOR BY
Floor Hatches	No bends, twists or open joints No	Visual inspection	All metalwork	Owner	Contractor

ITEM	TEST FOR	TEST STANDARD (ASTM OR OTHER TEST STANDARD)	FREQUENCY	FIRST TEST PAID FOR BY	RETESTS PAID FOR BY
	projecting edges or corners at intersections				
	Installation & Leakage	Visual inspection of finished installation	1 inspection	Owner	Contractor
	Field Performance	Demonstrate compliance to Contract Documents and Manufacturer's printed literature	1 test	Contractor	Contractor
	11-month Warranty Inspection	Demonstrate compliance to Contract Documents and Manufacturer's printed literature	1 test	Owner	Contractor

** END OF SECTION **

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**SECTION 07 92 00
JOINT SEALANTS**

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Materials, testing, and installation of joint sealants.

1.2 RELATED WORK

- A. Section 01 30 00: Contractor Submittals
- B. Section 01 40 00: Quality Control
- C. Section 01 53 00: Protection of Existing Facilities
- D. Section 01 55 00: Site Access and Storage
- E. Section 01 60 00: Products, Materials, Equipment and Substitutions
- F. Section 09 90 00: Protective Coatings

1.3 SYSTEM DESCRIPTION

- A. Where required throughout Work to provide positive barrier against passage of moisture and air, furnish and install complete operating joint sealant system in conformance with Manufacturer's installation requirements and compliance with applicable building, fire, mechanical, and plumbing codes and standards.
- B. Caulking, if noted shall be synonymous with sealant.

1.4 REFERENCES

- A. ASTM C834 Latex Sealants
- B. ASTM C920 Elastomeric Joint Sealants
- C. ASTM C990
- D. ASTM D994 Preformed Expansion Joint Filler for Concrete (Bituminous Type)
- E. ASTM D1751 Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types)
- F. ASTM D1752 Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction
- G. California Green Building Standards Code (CALGreen Code)
- H. Federal Specification SS-S-210 Sealing Compound, Preformed Plastic for Expansion Joints and Pipe Joints
- I. Federal Specification TT-S-01543A
- J. Federal Specification TT-S-00230-C
- K. SSPWC Standard Specifications for Public Works Construction (Greenbook) Section 201-3 "Expansion Joint Filler and Joint Sealants"

1.5 SUBMITTALS

- A. Furnish the following submittals.

SUBMITTAL	DESCRIPTION	
Catalog Data	Required per catalog data requirements.	
Installation Instructions	Required per installation or application instruction requirements. Include Manufacturer's recommendations for primer, joint cleaner and bond breaker.	
Certificate of Compliance	Submit sealant system certification per certificate of compliance requirements.	
Material and Color Samples	Required.	
Color Charts	Submit Manufacturer's standard color charts to allow owner to select color to match adjacent work.	
Warranty	Furnish one-year warranty from date of final acceptance	

- B. Refer to Section 01 30 00 for definition of requirements for catalog data, installation instructions, certificates of compliance, and material samples.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Refer to contract documents for delivery, storage, and handling requirements.
- B. Manufacturer's instruction and warranty requirements for delivery, storage and handling of joint sealants shall be strictly followed.
- C. Do not retain any material at job site which has exceeded shelf life recommended by Manufacturer.
- D. Do not retain any mixed sealant material at job site which has exceeded pot life recommended by Manufacturer.

1.7 PAYMENT

- A. Payment for Work in this section shall be included as part of the lump-sum for Bid Item No. 1.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Acceptable sealant Manufacturers include:

ITEM	MANUFACTURER	MANUFACTURER LOCATION
Sealant Type A Two-Part Polyurethane Self Leveling for Horizontal Surfaces	AEP Span	
	Atas International. Inc. Monarch	
	Pecora Corporation Traffic Grade Polyurethane	Harleysville, PA
	Roadware Incorporated "Flexible Cement II"	South Saint Paul, MN
	Accepted equal	
Sealant Type B Non Sag for Vertical Surfaces	AEP Span	
	Atas International. Inc. Monarch	
	Chem Link "Nova Link"	Schoolcraft, MI
	Accepted equal	

ITEM	MANUFACTURER	MANUFACTURER LOCATION
Sealant Type C Silicone	AEP Span	
	Atas International, Inc. Monarch	
	Pecora Corporation 800 Series	Harleysville, PA
	Accepted equal	
Sealant Type D Acrylic Latex	AEP Span	
	Atas International, Inc. Monarch	
	Pecora Corporation 900 Series	Harleysville, PA
	Accepted equal	
Sealant Type E Acoustical Sealant	Pecora Corporation AIS 919	Harleysville, PA
	Accepted equal	
Sealant Type F Polysulfide for Prolonged Submersion	Pecora Corporation Synthacalk GC2+	Harleysville, PA
	Accepted equal	
Mastic Premolded Plastic Gasket	Conseal International, Inc.	Tipp City, OH
	RAM-NEK Division Henry Company	Houston, TX
	Accepted equal	
Polystyrene Joint Filler		
	Accepted equal	

B. Acceptable Manufacturers for foam filler include:

ITEM	MANUFACTURER	MANUFACTURER LOCATION
Polyethylene Foam Filler for Pipe Support Bearing Pad	Sealed Air Corporation "Ethafoam"	Elmwood Park, NJ
	Hercules Inc Plastic Products Group Industrial Systems Department "Minicell"	Middletown, DE
	W R Meadows Sealtight "Deck-O-Foam" Expansion Joint Filler	Hampshire, IL
	Accepted equal	
Closed-Cell Sponge Rubber Foam Filler for Pipe Support Bearing Pad	American National Rubber "Rubberlite"	Ceredo, WV
	Armacell "Armaflex"	Munster, NRW, DE
	B F Goodrich Sponge Products, Div	Shelton, CT
	Cypress Sponge Rubber "Rubberite"	Santa Ana, CA
	Monmouth Rubber and Plastics Corp. "Durofoam"	Long Branch, NJ
	RBX Industries "Rubatex Insul-Tube 180"	Roanoke, VA
	Uniroyal Chemical "Ensolite"	Mishawaka, IN
Accepted equal		

2.2 MATERIALS

- A. Refer to Section 01 60 00 for basic requirements for products and materials.
- B. Adhesives, sealants and caulks used on Work shall comply with VOC limits set forth in Section 5.504.4.1 of CALGreen Code.
- C. Joint sealants shall be constructed of the following materials:

ITEM	MATERIAL	SPECIFICATION
Sealant Type A Two-Part Polyurethane Self Leveling for Horizontal Surfaces	Pour Grade Urethane	ASTM C920 Grade P Class 25
Sealant Type B Non Sag for Vertical Surfaces	Single Component Fed Spec TT-S-00230-C	ASTM C920 Type S Grade NS Class 25
Sealant Type C Silicone	Silicone	Fed Spec TT-S-01543A Class A
Sealant Type D Acrylic Latex	Acrylic Latex	ASTM C834
Sealant Type E Acoustical Sealant		
Sealant Type F Polysulfide for Prolonged Submersion		
Preformed Elastomeric Sealant		ASTM D2628
Mastic Joint Sealant for Buried Manholes and Vaults	Mortar	One part Portland cement to 2 parts well-graded sand passing No. 8 sieve per Section 03 30 00.
	Preformed Plastic Sealing Compound	Fed Spec SS-S-00210
Primer		Non-staining type recommended by sealant Manufacturer
Joint Cleaner		Noncorrosive and non-staining type recommended by sealant Manufacturer, compatible with joint compounds
Bond Breaker	Pressure Sensitive Tape	Recommended by sealant Manufacturer to suit application.
Rope Yarn	Rope Fiber or Cotton Wicking	Use raveled strands.

D. The following product design criteria, options and accessories are required:

ITEM	DESCRIPTION
Design Criteria	No leakage in plant quality control test at 10 psi for 1 hour minimum Temperature range 30°F to 120°F
Color	Owner will select from standard colors available from Manufacturer

E. Do not use non-elastic putty-type compounds.

F. Sealant compounds shall be of proper consistency to be readily worked and not be affected by vibration or by long exposure to outside climate and temperature.

G. Sealant compounds shall form a thin, tough, elastic film on surface, but remain permanently plastic underneath.

- H. Sealant compounds shall contain no acid nor ingredients which will stain stone, corrode metal or have an injurious effect on painting.
- I. Sealant compounds shall be colored to match adjacent work.
- J. Special sealants called for elsewhere shall be provided and installed as directed by Manufacturer.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Make field measurements needed to install joint sealants before submitting catalog data or ordering. Make minor changes in dimensions and alignments as needed to avoid utilities or structural conflicts.
- B. Verify surfaces are ready to receive work and joint measurements and surface conditions are as recommended by sealant Manufacturer.
- C. Remove loose materials and foreign matter which may affect adhesion of sealant.
- D. Joints and spaces to be sealed shall be clean, free from dust, and dry.
- E. Joints more than $\frac{3}{4}$ " deep and joints where suitable backstop has not been provided shall be packed with rope yarn to within $\frac{1}{2}$ " of surface before applying and sealing.

3.2 APPLICATION

- A. Furnish and apply joint sealants at locations shown on Plans and Submittals.
- B. The following installation standards shall be followed:
 - 1. Manufacturer's installation and warranty requirements
 - 2. Applicable OSHA and Cal OSHA regulations
 - 3. Applicable building, fire, plumbing, mechanical and electrical code requirements
- C. Refer variances between above documents and Contract Documents to Owner's Representative.
- D. Install joint sealants to tolerances and within temperature ranges recommended by Manufacturer.
- E. Tool joints concave unless otherwise shown.
- F. Joints in stone and precast work shall be slightly convex.
- G. Seal joints before final coat of paint is applied to adjacent work.

- H. Apply compound with a pressure gun having proper size nozzle or with knife as required.
- I. Use sufficient pressure to fill all voids and joints solid. Superficial painting of joints with a skin head will not be accepted.
- J. Remove excessive sealant and leave surfaces neat and clean. Upon completion, sealant shall have a smooth, even finish.
- K. All sealed joints shall be watertight.

3.3 FIELD QUALITY CONTROL

A. Field testing shall include:

ITEM	TEST FOR	TEST STANDARD (ASTM OR OTHER TEST STANDARD)	FREQUENCY	FIRST TEST PAID FOR BY	RETESTS PAID FOR BY
Joint Sealants	Installation & Leakage	Visual inspection of finished installation and water test at Owner's discretion	1 inspection	Owner	Contractor
	Field Performance	Demonstrate compliance to Contract Documents and Manufacturer's printed literature	1 test	Contractor	Contractor
	11-month Warranty Inspection	Demonstrate compliance to Contract Documents and Manufacturer's printed literature	1 test	Owner	Contractor

**** END OF SECTION ****

**SECTION 09 90 00
PROTECTIVE COATINGS**

PART 1 - GENERAL

1.1 WORK OF THIS SECTION

- A. The WORK of this Section includes the protective coating of all indicated surfaces including surface preparation, pretreatment, coating application, touch-up, protection of surfaces not to be coated, cleanup, and all appurtenant work.
- B. Definitions:
1. The term "paint", "coatings", or "finishes" as used herein, shall include surface treatments, emulsions, enamels, paints, epoxy resins, and all other protective coatings, except galvanizing or anodizing, whether used as a pretreatment, primer, intermediate coat, or finish coat.
 2. The term "DFT" shall mean minimum dry film thickness, without any negative tolerance.
- C. The following surfaces shall not be protective coated hereunder unless indicated.
1. Concrete except in chemical(s) containment areas
 2. Stainless steel
 3. Machined surfaces
 4. Grease fittings
 5. Glass
 6. Equipment nameplates
 7. Platform gratings, stair treads, door thresholds, and other walk surfaces
- D. The coating system schedules summarize the surfaces to be coated, the required surface preparation, and the coating systems to be applied. Coating notes on the drawings are used to show exceptions to the schedules, to show or extend the limits of coating systems, or to clarify or show details for application of the coating systems.

1.2 RELATED SECTIONS

- A. Section 01 30 00: Contractor Submittals
- B. Section 01 40 00: Quality Control
- C. Section 01 53 00: Protection of Existing Facilities
- D. Section 01 55 00: Site Access and Storage
- E. Section 01 60 00: Products, Materials, Equipment and Substitutions
- F. Section 09 96 56: Fusion-Bonded Epoxy Linings and Coatings

1.3 CODES

- A. The WORK of this Section shall comply with the current editions of the following codes as adopted by the City of San Diego Municipal Code:
1. Uniform Building Code

1.4 STANDARD SPECIFICATIONS

- A. Except as otherwise indicated in this Section of the Specifications, the CONTRACTOR shall comply with the Standard Specifications for Public Works Construction (SSPWC), as specified in Section 01 09 00 - REFERENCE STANDARDS.

1.5 SPECIFICATIONS AND STANDARDS

- A. Except as otherwise indicated, the current editions of the following apply to the WORK of this Section:
1. References herein to "SSPC Specifications" or "SSPC" shall mean the published standards of the Steel Structures Painting Council, 40 24th Street, 6th Floor, Pittsburgh, PA 15222.
 2. References herein to "NACE" shall mean the published standards of the National Association of Corrosion Engineers, P.O. Box 281340, Houston, TX 77218-8340.
 3. Commercial Standards:
 - ANSI A13.1 Scheme for Identification of Piping Systems
 - ANSI/AWWA C105 Polyethylene Encasement for Ductile Iron Piping
 - ANSI/AWWA C203 Coal-Tar Protective Coatings and Linings for Steel Water Pipelines - Enamel and Tape-Hot-Applied
 - ANSI/AWWA C209 Cold-Applied Tape Coatings for the Exterior of Special Sections, Connections, and Fittings for Steel Water Pipelines
 - ANSI/AWWA C217 Petrolatum and Petroleum Wax Tape Coatings for the Exterior of Connections and Fittings for Steel Water Pipelines
 4. Federal Specifications:
 - TT-P-28 Paint, Aluminum, Heat Resisting (1200OF)
 - DOD-P-23236 Military Specification, Paint Coating Systems, Steel Ship Tank, Fuel and Salt Water Ballast

1.6 SHOP DRAWINGS AND SAMPLES

- A. The following shall be submitted in compliance with Section 01300 unless indicated otherwise.
- B. Submittals shall include the following information and be submitted at least 30 days

prior to protective coating work.

1. Coating Materials List: The CONTRACTOR shall provide a coating materials list which indicates the manufacturer and the coating number, keyed to the coating systems herein, prior to or at the time of submittal of samples.
2. Paint Manufacturer's Catalogue: For each paint system to be used the CONTRACTOR shall submit manufacturer's catalogue containing the following data
 - a. Paint Manufacturer's data sheet for each product used, including statements on the suitability of the material for the intended use.
 - b. Technical and performance information that demonstrates compliance with the system performance and material requirements.
 - c. Manufacturer's Instructions and recommendations on surface preparation, thinning, mixing, handling, applying and proper storage.
 - d. Colors available for each product (where applicable).
 - e. Compatibility of shop and field applied coatings (where applicable).
 - f. Material safety data sheet for each product used.

C. Samples:

1. Samples of all paint, finishes, and other coating materials shall be submitted on 8.5-inch by 11-inch sheet metal. Each sample shall be completely coated over its entire surface with one protective coating material, type, and color.
2. Qualifications of Painting Subcontractor
 - a. Copy of a valid State of California license as required for the application of coatings.
 - b. Contractor shall submit references which show that the painting subcontractor has demonstrated successful experience with the indicated coating systems in the recent past. Provide the name, address and telephone number of the owner of each installation. The CONTRACTOR shall obtain the references from the subcontractor and submit them to the RESIDENT ENGINEER.

1.7 SERVICES OF MANUFACTURER

- A. For submerged and severe service coating systems, the CONTRACTOR shall require the paint manufacturer to furnish the following services:
1. The manufacturer's representative shall furnish at least 6 hours of on-site instruction in the proper surface preparation, use, mixing, application and curing of the coating systems.
 2. The manufacturer's representative shall personally observe the start of surface preparation, mixing, and application of the coating materials.

3. The manufacturer's representative shall provide technical support to resolve field problems associated with manufacturer's products furnished under this Contract or the application thereof.
4. The manufacturer shall certify that these services have been furnished, and the CONTRACTOR shall submit the certification within 7 days of completion of each paint system.

1.8 INSPECTION AND TESTING

- A. **General:** The CONTRACTOR shall give the RESIDENT ENGINEER a minimum of 3 days' advance notice of the start of any field surface preparation work or coating application work, and a minimum of 7 days' advance notice of the start of any shop surface preparation work.
- B. All such work shall be performed only in the presence of the RESIDENT ENGINEER, unless the RESIDENT ENGINEER has granted prior approval to perform such work in its absence.
- C. Inspection by the RESIDENT ENGINEER, or the waiver of inspection of any particular portion of the work, shall not relieve the CONTRACTOR of its responsibility to perform the work in accordance with these Specifications.
- D. Scaffolding shall be erected and moved to locations where requested by the RESIDENT ENGINEER to facilitate inspection. Additional illumination shall be furnished to cover all areas to be inspected.
- E. **Inspection Devices:** The CONTRACTOR shall furnish, until final acceptance of such coatings, inspection devices in good working condition for the detection of holidays and measurement of dry-film thicknesses of protective coatings. Dry-film thickness gauges shall be made available for the RESIDENT ENGINEER'S use at all times while coating is being done, until final acceptance of such coatings. The CONTRACTOR shall furnish the services of a trained operator of the holiday detection devices until the final acceptance of such coatings. Holiday detection devices shall be operated only in the presence of the RESIDENT ENGINEER.
- F. **Holiday Testing:** The CONTRACTOR shall holiday test all coated ferrous surfaces inside a steel reservoir, or other surfaces which will be submerged in water or other liquids, or surfaces which are enclosed in a vapor space in such structures and surfaces coated with any of the submerged and severe service coating systems. Areas which contain holidays shall be marked and repaired or recoated in accordance with the coating manufacturer's printed instructions and then retested. In addition to the above the RESIDENT ENGINEER may test any surfaces for any number of times at no additional cost to CONTRACTOR. All defects so found shall be corrected by the CONTRACTOR at no additional cost to the OWNER.
 1. **Coatings with Thickness Exceeding 20 Mils:** For surfaces having a total dry film coating thickness exceeding 20 mils: pulse-type holiday detector such as Tinker & Razor Model AP-W, D.E. Stearns Co. Model 14/20, or equal shall be used. The unit shall be adjusted to operate at the voltage required to cause a spark jump across an air gap equal to twice the indicated coating thickness.
 2. **Coatings with Thickness of 20 Mils or Less:** For surfaces having a total dry film coating thickness of 20 mils or less: Tinker & Razor Model M1 non-destructive type holiday detector, K-D Bird Dog, or equal shall be used. The unit shall operate at less than 75-volts. For thicknesses between 10

and 20 mils, a non-sudsing type wetting agent, such as Kodak Photo-Flo, or equal, shall be added to the water prior to wetting the detector sponge.

- G. Film Thickness Testing: On ferrous metals, the dry film coating thickness shall be measured in accordance with the SSPC "Paint Application Specification No. 2" using a magnetic-type dry film thickness gauge such as Mikrotest model FM, Elcometer model 111/1EZ, or equal. Each coat shall be tested for the correct thickness. No measurements shall be made until at least 8 hours after application of the coating. On non-ferrous metals and other substrates, the coating thicknesses shall be measured at the time of application using a wet film gauge.
- H. Surface Preparation: Evaluation of blast cleaned surface preparation work will be based upon comparison of the blasted surfaces with the standard samples available from the NACE, using NACE standard TM-01-70 and TM-01-75.

1.9 WARRANTY INSPECTION

- A. A warranty inspection may be conducted during the eleventh month following completion of all coating and painting work. The CONTRACTOR and a representative of the coating material manufacturer shall attend this inspection. All defective work shall be repaired in accordance with these specifications and to the satisfaction of the OWNER. The OWNER may, by written notice to the CONTRACTOR, reschedule the warranty inspection to another date within the one-year correction period, or may cancel the warranty inspection altogether. If a warranty inspection is not held, the CONTRACTOR shall not be relieved of its responsibilities under the Contract Documents.

1.10 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Coating materials shall be sealed in containers that plainly show the designated name, formula or specification number, batch number, color, date of manufacture, manufacturer's directions, and name of manufacturer, all of which shall be plainly legible at the time of use.
- B. Paint materials shall be carefully stored in a manner that will prevent damage and in an area that is protected from deleterious elements.

1.11 PAYMENT

- A. Payment for Work in this section shall be included as part of the lump-sum for Bid Item No. 1.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Suitability: The CONTRACTOR shall use suitable coating materials as recommended by Manufacturer for the intended service.
- B. Compatibility: In any coating system only compatible materials from a single manufacturer shall be used in the work. Particular attention shall be directed to compatibility of primers and finish coats. If necessary, a barrier coat shall be applied between existing prime coat and subsequent field coats to ensure compatibility.

C. Colors: All colors and shades of colors of all coats of paint shall be as indicated or selected by the RESIDENT ENGINEER. Each coat shall be of a slightly different shade, to facilitate inspection of surface coverage of each coat. Finish colors shall be as selected from the manufacturer's standard color samples by the RESIDENT ENGINEER.

D. Substitute or "Or Equal" Products:

1. To establish equality under Section 01 60 00 – Products, Materials, Equipment, and Substitutions, the CONTRACTOR shall provide satisfactory documentation from the firm manufacturing the proposed substitute or "or-equal" material that said material meets the requirements and is equivalent or better than the listed materials in the following properties:

- a. Quality
- b. Durability
- c. Resistance to abrasion and physical damage
- d. Life expectancy
- e. Ability to recoat in future
- f. Solids content by volume
- g. Dry film thickness per coat
- h. Compatibility with other coatings
- i. Suitability for the intended service
- j. Resistance to chemical attack
- k. Temperature limitations in service and during application
- l. Type and quality of recommended undercoats and topcoats
- m. Ease of application
- n. Ease of repairing damaged areas
- o. Stability of colors

2. The City shall be the sole arbiter of substitutions and "or equals" and their decision shall be final. The process shall be as identified in Section 01600.

E. Protective coating materials shall be standard products produced by recognized manufacturers who are regularly engaged in production of such materials for essentially identical service conditions. Where requested, the CONTRACTOR shall provide the name of least one successfully performing application of the proposed manufacturer's products in a project of comparable size and complexity constructed in the recent past.

- F. The cost of all testing and analyzing proposed substitute materials that may be required by the RESIDENT ENGINEER shall be paid by the CONTRACTOR at no additional cost to the OWNER. If the proposed substitution requires changes in the contract work, the CONTRACTOR shall bear all such costs involved and the costs of allied trades affected by the substitution at no additional cost to the OWNER.

2.2 INDUSTRIAL COATING SYSTEMS

- A. Material Sources: Each of the following manufacturers is capable of supplying many of the industrial coating materials indicated herein. Where manufacturers and paint numbers are listed, it is to show the type and quality of coatings that are required. Proposed substitute materials shall be considered as indicated above. All industrial coating materials shall be materials that have a record of satisfactory performance in industrial plants, manufacturing facilities, water, and wastewater treatment plants.
1. PPG Amercoat (formerly Ameron)
 2. Carboline Coatings Company
 3. Sherwin-Williams Company
 4. International (Akzo Nobel)
 5. Tnemec Company
- B. System 4 -- Aliphatic Polyurethane: Two component aliphatic acrylic polyurethane coating material with excellent color and gloss retention, resistance to splash from acid and alkaline chemicals, resistance to chemical fumes and severe weathering and with a minimum solids content of 65 percent by volume. Primer shall be a rust inhibitive two component epoxy coating with a minimum solids content of 75 percent by volume.
1. Prime coat (DFT = 5 mils), Tnemec 66HS, or equal.
 2. Finish coat (one or more, DFT = 3 mils), Tnemec 1095, or equal.
 3. Total system DFT = 8 mils.
 4. More than one finish coat shall be applied as necessary to produce a finish with uniform color and texture.
- C. System 7 -- Acrylic: Single component, semi-gloss water based acrylic shall have a minimum solids content of 40 percent by volume. Prime coat shall be as recommended by manufacturer. The coating material shall be available in the ANSI safety colors.
1. Prime coat (DFT = 3 mils), Tnemec Series 115, or equal.
 2. Finish coats (2 or more, DFT = 6 mils), Tnemec 1029, or equal.
 3. Total system DFT = 9 mils.

- D. System 8 – Epoxy, Equipment: Two component, rust inhibitive polyamide cured epoxy coating material shall provide a re-coatable finish that is available in a wide selection of colors. The coating material shall have a minimum solids content of 75 percent by volume and be resistant to service conditions of condensing moisture, splash and spillage of lubricating oils, and frequent washdown and cleaning
1. Prime coat DFT = 4 mils, Tnemec 66HS, or equal. (Omit if equipment/item is shop primed).
 2. Prime coat, where shop applied. (DFT = 3 mils), universal primer, Tnemec 394, or equal.
 3. Finish coat (2 or more, DFT =8 mils), Tnemec 66HS, or equal.
 4. Total system DFT = 11 mils.
- E. System 11 -- Aliphatic Polyurethane, Concrete: Two component aliphatic polyester polyurethane coating material shall provide superior color and gloss retention, resistance to splash from acid and alkaline chemicals, and resistance to chemical fumes and severe weathering, and with a minimum solids content of 65 percent by volume. Filler-sealer compound shall be a two component epoxy material used to provide a smooth surface for the epoxy intermediate coat. The filler-sealer shall be applied to the entire concrete surface and worked into the concrete surface with a wide blade putty knife or squeegee. The intermediate coat shall be a high-build epoxy coating with a minimum solids content of 70 percent by volume.
1. Prime coat (Filler-sealer), Tnemec 218-1000, or equal.
 2. Intermediate coat (DFT = 5 mils), Tnemec 66HS, or equal.
 3. Finish coats (1 coat, DFT = 2.5 mils), Tnemec V290, or equal.

2.3 SUBMERGED OR SEVERE SERVICE COATING SYSTEMS

- A. Materials Sources: The manufacturers' products listed in this paragraph are materials which satisfy the material descriptions of this paragraph and have a documented successful record for long term submerged or severe service conditions. Proposed substitute products shall be considered as indicated above.
- B. System 101 -- Wax-Tape: Wax-Tape coating materials and procedures shall be in accordance with ANSI/AWWA C217. Prefabricated tape shall be Trenton #1 Wax-Tape or equal. The system shall be a 3 part system with a total system DFT = 70 mils to 90 mils. (note: Owner will NOT allow the new suction piping in the wetwell to be wax tape wrapped. However, buried ferrous piping shall be wax tape wrapped in addition to the exterior coating to the specified Scotchkote coating system).
- B. System 106 -- Fusion Bonded Epoxy: All ferrous piping submerged, wetted, aboveground, exposed or buried, including internal wetted surfaces of pumps and valves, shall be Fusion-Bonded Epoxy Coated inside and outside. The coating material shall be a 100 percent powder epoxy applied in accordance with the ANSI/AWWA C213 "AWWA Standard for Fusion-Bonded Epoxy Coating for the Interior and Exterior of Steel Water Pipelines," except that the surface preparation shall be as specified in the coating system schedule of this Section. The coating shall be applied using the fluidized bed process and shall be 3M Scotchkote Coating 134 or equal. Refer to Section 33 30 34, Ductile Iron Pipe for additional data.

1. Exterior non-buried or buried surface including valves, couplings, pipes, DFT = 24 mils minimum, 3M Scotchkote Coating 134 (electrostatic) or equal, applied in one coat.
 2. Exterior and interior coating of ductile iron or steel pipe and fittings, DFT = 24 mils.
 3. Interior coating of valves, DFT = 12 mils.
 4. For field repairs, the use of a liquid epoxy will be permitted, applied in one coat to provide a DFT of 15 mils. The liquid epoxy shall be Scotchkote 312 or as recommended by the powder epoxy manufacturer.
- C. System 102 -- H2S Epoxy: High-build, polyamine cured epoxy shall have a solids content of at least 99 percent by volume, and shall be suitable for long-term immersion service in primary wastewater and hydrogen sulfide gas.

For a Steel Substrate:

1. Finish Coat (1 or more, DFT = 30 to 40 mils), Tnemec 435 Perma-Glaze, or equal.

For a Concrete Substrate:

1. Filler/Surfacer: (DFT = 1/16"), Tnemec 218-1000 Mortar Clad
2. Finish Coat (1 or more, DFT = 60 mils), Tnemec 435 Perma-Glaze, or equal.

2.4 SPECIAL COATING SYSTEMS

- A. System 200 -- PVC Tape: Prior to wrapping the pipe with PVC tape, the pipe and fittings first shall be primed using a primer recommended by the PVC tape manufacturer. After being primed, the pipe shall be wrapped with a 20-mil adhesive PVC tape, half-lapped, to a total thickness of 40 mils.
- B. System 208 -- Aluminum Metal Isolation: Two coats of a high build polyamide epoxy painting, such as Tnemec 66HS, or equal (8 mils). Total thickness of system DFT = 8.0 mils.

PART 3 - EXECUTION

3.1 WORKMANSHIP

- A. Skilled craftsmen and experienced supervision shall be used on all WORK.
- B. Coating shall be done in a workmanlike manner so as to produce an even film of uniform thickness. Edges, corners, crevices, and joints shall receive special attention to insure thorough cleaning and an adequate thickness of coating material. The finished surfaces shall be free from runs, drops, ridges, waves, laps, brush marks, and variations in color, texture, and finish. The hiding shall be so complete that the addition of another coat would not increase the hiding. Special attention shall be given to insure that edges, corners, crevices, welds, and similar areas receive a film thickness equivalent to adjacent areas, and installations shall be protected by the use of drop cloths or other precautionary measures.
- C. All damage to surface resulting from the WORK shall be cleaned, repaired, and

refinished to original condition.

3.2 STORAGE, MIXING, AND THINNING OF MATERIALS

- A. Manufacturer's Recommendations: Unless otherwise indicated, the coating manufacturer's printed recommendations and instructions for thinning, mixing, handling, applying, and protecting its coating materials, for preparation of surfaces for coating, and for all other procedures relative to coating shall be strictly observed.
- B. All protective coating materials shall be used within the manufacturer's recommended shelf life.
- C. Storage and Mixing: Coating materials shall be stored under the conditions recommended by the Material Safety Data Sheets, and shall be thoroughly stirred, strained, and kept at a uniform consistency during application. Coatings of different manufacturers shall not be mixed together.

3.3 PREPARATION FOR COATING

- A. General: All surfaces to receive protective coatings shall be cleaned as indicated prior to application of coatings. The CONTRACTOR shall examine all surfaces to be coated, and shall correct all surface defects before application of any coating material. All marred or abraded spots on shop-primed and on factory-finished surfaces shall receive touch-up restoration prior to any coating application. Surfaces to be coated shall be dry and free of visible dust.
- B. Protection of Surfaces Not to be Coated: Surfaces which are not to receive protective coatings shall be protected during surface preparation, cleaning, and coating operations.
- C. All hardware, lighting fixtures, switchplates, machined surfaces, couplings, shafts, bearings, nameplates on machinery, and other surfaces not to be painted shall be removed, masked or otherwise protected. Drop cloths shall be provided to prevent coating materials from falling on or marring adjacent surfaces. The working parts of all mechanical and electrical equipment shall be protected from damage during surface preparation and coating operations. Openings in motors shall be masked to prevent entry of coating or other materials.
- D. Care shall be exercised not to damage adjacent work during blast cleaning operations. Spray painting shall be conducted under carefully controlled conditions. The CONTRACTOR shall be fully responsible for and shall promptly repair any and all damage to adjacent work or adjoining property occurring from blast cleaning or coating operations.
- E. Protection of Painted Surfaces: Cleaning and coating shall be scheduled so that dust and other contaminants from the cleaning process will not fall on wet, newly-coated surfaces.

3.4 SURFACE PREPARATION STANDARDS

- A. The following referenced surface preparation specifications of the Steel Structures Painting Council shall form a part of this specification:
 - 1. Solvent Cleaning (SSPC-SP1): Removal of oil, grease, soil, salts, and other soluble contaminants by cleaning with solvent, vapor, alkali, emulsion, or steam.

2. Hand Tool Cleaning (SSPC-SP2): Removal of loose rust, loose mill scale, loose paint, and other loose detrimental foreign matter, by hand chipping, scraping, sanding, and wire brushing.
3. Power Tool Cleaning (SSPC-SP3): Removal of loose rust, loose mill scale, loose paint, and other loose detrimental foreign matter, by power tool chipping, descaling, sanding, wire brushing, and grinding.
4. White Metal Blast Cleaning (SSPC-SP5): Removal of all visible rust, oil, grease, soil, dust, mill scale, paint, oxides, corrosion products and foreign matter by blast cleaning.
5. Commercial Blast Cleaning (SSPC-SP6): Removal of all visible oil, grease, soil, dust, mill scale, rust, paint, oxides, corrosion products, and other foreign matter, except that staining shall be limited to no more than 33 percent of each square inch of surface area.
6. Brush-Off Blast Cleaning (SSPC-SP7): Removal of all visible oil, grease, soil, dust, loose mill scale, loose rust, and loose paint. Tightly adherent mill scale, rust and paint which cannot be removed by a dull putty knife may remain.
7. Near-White Blast Cleaning (SSPC-SP10): Removal of all visible oil, grease, soil, dust, mill scale, rust, paint, oxides, corrosion products, and other foreign matter, except that staining shall be limited to no more than 5 percent of each square inch of surface area.

3.5 METAL SURFACE PREPARATION (UN GALVANIZED)

- A. The minimum abrasive blasting surface preparation shall be as specified in the coating system schedules included at the end of this Section. Where there is a conflict between these specifications and the coating manufacturer's printed recommendations for the intended service, the more stringent degree of cleaning shall apply.
- B. Workmanship for metal surface preparation shall be in conformance with the current SSPC Standards and this Section. Blast cleaned surfaces shall match the standard samples available from the National Association of Corrosion Engineers, NACE Standard TM-01-70 - Visual Standard for Surfaces of New Steel Airblast Cleaned with Sand Abrasive and TM-01-75 - Visual Standard for Surfaces of New Steel Centrifugally Blast Cleaned with Steel Grits.
- C. Oil, grease, welding fluxes and other surface contaminants shall be removed by solvent cleaning per SSPC-SP1 prior to blast cleaning.
- D. All sharp edges shall be rounded or chamfered and all burrs, and surface defects and weld splatter shall be ground smooth prior to blast cleaning.
- E. The type and size of abrasive shall be selected to produce a surface profile that meets the manufacturer's recommendation for the specific coating and service conditions. Abrasive shall not be used unless approved by the RESIDENT ENGINEER.
 1. Submerged and Severe Service

- a. Automated blasting systems shall not be used for surfaces that will be in submerged service but are acceptable for severe service.
- b. Abrasives for submerged and severe service coatings shall be clean, hard, sharp cutting crushed: no metallic abrasives shall be used.

2. Other Services

- a. Either automated or manual methods of blasting may be used.
 - b. Abrasives shall be clean, oil-free metallic abrasives, composed of at least 50 percent grit.
- F. The CONTRACTOR shall comply with the applicable federal, state, and local air pollution control regulations for blast cleaning.
- G. Compressed air for air blast cleaning shall be supplied at adequate pressure from well maintained compressors equipped with oil/moisture separators which remove at least 95 percent of the contaminants.
- H. Surfaces shall be cleaned of all dust and residual particles of the cleaning operation by dry air blast cleaning, vacuuming or another approved method prior to painting.
- I. Enclosed areas and other areas where dust settling is a problem shall be vacuum cleaned and wiped with a tack cloth.
- J. Damaged or defective coating shall be removed by the specified blast cleaning to meet the clean surface requirements before recoating.
- K. If the specified abrasive blast cleaning will damage adjacent work, the area to be cleaned is less than 100 square feet, and the coated surface will not be submerged in service, then SSPC-SP2, or SSPC-SP3 may be used.
- L. Shop applied coatings of unknown composition shall be completely removed before the specified coatings are applied. Valves, castings, ductile or cast iron pipe, and fabricated pipe or equipment shall be examined for the presence of shop-applied temporary coatings. Temporary coatings shall be completely removed by solvent cleaning per SSPC-SP1 before the abrasive blast cleaning work has been started.
- M. Shop primed equipment shall be solvent cleaned in the field before finish coats are applied.

3.6 SURFACE PREPARATION FOR GALVANIZED FERROUS METAL

- A. Galvanized ferrous metal shall be alkaline cleaned per SSPC-SP1 to remove oil, grease, and other contaminants detrimental to adhesion of the protective coating system to be used, followed by brush-off blast cleaning per SSPC-SP7.
- B. Pretreatment coatings of surfaces shall be in accordance with the printed recommendations of the coating manufacturer.

3.7 SURFACE PREPARATION OF FERROUS SURFACES WITH EXISTING COATINGS, EXCLUDING STEEL RESERVOIR INTERIORS

- A. General: All grease, oil, heavy chalk, dirt, or other contaminants shall be removed by

solvent or detergent cleaning prior to abrasive blast cleaning. The generic type of the existing coatings shall be determined by laboratory testing.

- B. Abrasive Blast Cleaning: The CONTRACTOR shall provide the degree of cleaning specified in the coating system schedule for the entire surface to be coated. If the degree of cleaning is not specified in the schedule, deteriorated coatings shall be removed by abrasive blast cleaning to SSPC-SP6, Commercial Blast Cleaning. Areas of tightly adhering coatings shall be cleaned to SSPC-SP7, Brush-off Blast Cleaning, with the remaining thickness of existing coating not to exceed 3 mils.
- C. Incompatible Coatings: If coatings to be applied are not compatible with existing coatings the CONTRACTOR shall apply intermediate coatings per the paint manufacturer's recommendation for the specified coating system or shall completely remove the existing coating prior to abrasive blast cleaning. A small trial application shall be conducted for compatibility prior to painting large areas.
- D. Unknown Coatings: Coatings of unknown composition shall be completely removed prior to application of new coatings.
- E. Water Abrasive or Wet Abrasive Blast Cleaning: Where indicated or where job site conditions do not permit dry abrasive blasting for industrial coating systems due to dust or air pollution considerations, water abrasive blasting or wet abrasive blasting may be used. In both methods, paint-compatible corrosion inhibitors shall be used, and coating application shall begin as soon as the surfaces are dry. Water abrasive blasting shall be done using high pressure water with sand injection. In both methods, the equipment used shall be commercially produced equipment with a successful service record. Wet blasting methods shall not be used for submerged and severe service coating systems unless indicated.

3.8 CONCRETE SURFACE PREPARATION

- A. Surface preparation shall not begin until at least 30 days after the concrete or masonry has been placed.
- B. All oil, grease, and form release and curing compounds shall be removed by detergent cleaning per SSPC-SP1 before abrasive blast cleaning.
- C. Concrete, concrete block masonry surfaces and deteriorated concrete surfaces to be coated shall be abrasive blast cleaned to remove existing coatings, laitance, deteriorated concrete, and to roughen the surface equivalent to the surface of the No. 80 grit flint sandpaper.
- D. If acid etching is required by the coating application instructions, the treatment shall be made after abrasive blasting. After etching, rinse surfaces with water and test the pH. The pH shall be between neutral and 8.
- E. Surfaces shall be clean and as recommended by the coating manufacturer before coating is started.
- F. Unless required for proper adhesion, surfaces shall be dry prior to coating. The presence of moisture shall be determined with a moisture detection device such as Delmhorst Model DB, or equal.

3.9 PLASTIC, FIBER GLASS, AND NONFERROUS METALS SURFACE PREPARATION

- A. Plastic and fiber glass surfaces shall be sanded or brush off blast cleaned prior to solvent cleaning with a chemical compatible with the coating system primer.
- B. Non-ferrous metal surfaces shall be solvent-cleaned SSPC-SP1 followed by sanding or brush-off blast cleaning SSPC-SP7.
- C. All surfaces shall be clean and dry prior to coating application.

3.10 SHOP COATING REQUIREMENTS

- A. Unless indicated otherwise, items of equipment, or parts of equipment which are not submerged in service, shall be shop primed and then finish coated in the field after installation with the indicated or approved color. The methods, materials, application equipment and all other details of shop painting shall comply with this section. If the shop primer requires top-coating within a specified period of time, the equipment shall be finish coated in the shop and then touch-up painted after installation.
- B. All items of equipment, or parts and surfaces of equipment which are submerged or inside an enclosed hydraulic structure when in service, with the exception of pumps and valves, shall have all surface preparation and coating work performed in the field.
- C. For certain pieces of equipment it may be undesirable or impractical to apply finish coatings in the field. Such equipment may include engine generator sets, equipment such as electrical control panels, switchgear or main control boards, submerged parts of pumps, ferrous metal passages in valves, or other items where it is not possible to obtain the specified quality in the field. Such equipment shall be primed and finish coated in the shop and touched up in the field with the identical material after installation. The CONTRACTOR shall require the manufacturer of each such piece of equipment to certify as part of its shop drawings that the surface preparation is in accordance with these specifications. The coating material data sheet shall be submitted with the shop drawings for the equipment.
- D. For certain small pieces of equipment the manufacturer may have a standard coating system which is suitable for the intended service conditions. In such cases, the final determination of suitability will be made during review of the shop drawing submittals. Equipment of this type generally includes only indoor equipment such as instruments, small compressors, and chemical metering pumps.
- E. Shop painted surfaces shall be protected during shipment and handling by suitable provisions including padding, blocking, and the use of canvas or nylon slings. Primed surfaces shall not be exposed to the weather for more than 2 months before top-coated, or less time if recommended by the coating manufacturer.
- F. Damage to shop-applied coatings shall be repaired in accordance with this Section and the coating manufacturer's printed instructions.
- G. The CONTRACTOR shall make certain that the shop primers and field topcoats are compatible and meet the requirements of this Section. Copies of applicable coating manufacturer's data sheets shall be submitted with equipment shop drawings.

3.11 APPLICATION OF COATINGS

- A. The application of protective coatings to steel substrates shall be in accordance with

"Paint Application Specification No. 1, (SSPC PA1)," Steel Structures Painting Council.

- B. Cleaned surfaces and all coats shall be inspected prior to each succeeding coat. The CONTRACTOR shall schedule such inspection with the RESIDENT ENGINEER in advance.
- C. Blast cleaned ferrous metal surfaces shall be painted before any rusting or other deterioration of the surface occurs. Blast cleaning shall be limited to only those surfaces that can be coated in the same working day.
- D. Coatings shall be applied in accordance with the manufacturer's instructions and recommendations, and this Section, whichever has the most stringent requirements.
- E. Special attention shall be given to edges, angles, weld seams, flanges, nuts and bolts, and other places where insufficient film thicknesses are likely to be present. Use stripe painting for these areas.
- F. Special attention shall be given to materials which will be joined so closely that proper surface preparation and application are not possible. Such contact surfaces shall be coated prior to assembly or installation.
- G. Finish coats, including touch-up and damage repair coats shall be applied in a manner which will present a uniform texture and color matched appearance.
- H. Coatings shall not be applied under the following conditions:
 - 1. Temperature exceeding the manufacturer's recommended maximum and minimum allowable.
 - 2. Dust or smoke laden atmosphere.
 - 3. Damp or humid weather.
 - 4. When the substrate or air temperature is less than 5 degrees F above the dewpoint.
 - 5. When air temperature is expected to drop below 40 degrees F or less than 5 degrees F above the dewpoint within 8 hours after application of coating.
 - 6. When wind conditions are not calm.
- I. Dewpoint shall be determined by use of a sling psychrometer in conjunction with U.S. Dept. of Commerce, Weather Bureau psychrometric tables.
- J. Steel piping shall be abrasive blast cleaned and primed before installation.
- K. The finish coat on all work shall be applied after all concrete, masonry, and equipment installation is complete and the work areas are clean and dust free.

3.12 CURING OF COATINGS

- A. The CONTRACTOR shall maintain curing conditions in accordance with the conditions recommended by the coating material manufacturer or by this Section, whichever is the stringent, prior to placing the completed coating system into service.

- B. In the case of enclosed areas, forced air ventilation, using heated air if necessary, may be required until the coatings have fully cured.
- C. Forced Air Ventilation of Steel Reservoirs and Enclosed Hydraulic Structures: Forced air ventilation is required for the application and curing of coatings on the interior surfaces of enclosed hydraulic structures. During application and curing periods continuously exhaust air from the lowest level of the structure using portable ducting. After all interior coating operations have been completed provide a final curing period for a minimum of 10 days, during which the forced ventilation system shall operate continuously. For additional requirements, refer to the specific coating system being used.

3.13 IDENTIFICATION OF PIPING

- A. Identification of all unburied piping, fittings, valves, pumps and equipment shall be in accordance with Section 33 05 26, "Utility Identification" or other requirements per the Greenbook/Whitebook.
- B. Every valve or connection, where it may be possible for a worker to be exposed to a hazardous substance, shall be labeled per General Industry Safety Orders, Article 112 and 5194.
- C. All unburied pipe in structures and in chemical pipe trenches shall be color-code painted. Colors shall be as selected by the RESIDENT ENGINEER, or as indicated.

3.14 COATING SYSTEM SCHEDULES - FERROUS METALS

A. Coating System Schedule, Ferrous Metal - Not Galvanized:

	<u>Item</u>	<u>Surface Prep.</u>	<u>System No.</u>
FM-1	All surfaces indoors and outdoors, exposed or covered, except those included below.	Commercial blast cleaning SSPC-SP6	(4) aliphatic polyurethane
FM-2	Ferrous surfaces of couplings.	Solvent cleaning SSPC-SP1, followed by near-white metal blast cleaning SSPC-SP5	(106) fusion-bonded epoxy
FM-3	Buried surfaces that are not indicated to be coated elsewhere.	White metal blast cleaning SSPC-SP5	(106) fusion-bonded epoxy
FM-4	Surfaces of indoor equipment, not submerged.	Commercial blast cleaning SSPC-SP6	(8) epoxy, equipment
FM-5	Surfaces exposed to sewage.	White metal blast cleaning SSPC-SP5	(106) fusion-bonded epoxy
FM-6	Buried pipe, couplings, fittings, valves, and flanged joints (where piping is ductile or cast iron,	Removal of dirt, grease, oil	(106) fusion-bonded epoxy and (101) Wax-Tape

FM-7	Exposed pipe, couplings, fittings, valves, and flanged joints (where piping is ductile or cast iron)	Removal of dirt, grease, oil	(106) fusion-bonded epoxy
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B. Coating System Schedule, Ferrous Metal Galvanized: Pretreatment coatings, barrier coatings, or washes shall be applied as recommended by the coating manufacturer. All galvanized surfaces shall be coated.

<u>Item</u>	<u>Surface Prep.</u>	<u>System No.</u>
FMG-1	All exposed surfaces indoors and outdoors, except those included below.	Solvent cleaning SSPC-SP1 (4) aliphatic polyurethane

3.16 COATING SYSTEM SCHEDULE, NON-FERROUS METAL, PLASTIC, FIBER GLASS

A. Where isolated non-ferrous parts are associated with equipment or piping, the CONTRACTOR shall use the coating system for the adjacent connected surfaces. Do not coat handrails, gratings, frames or hatches. Only primers recommended by the coating manufacturer shall be used.

<u>Item</u>	<u>Surface Prep.</u>	<u>System No.</u>
NFM-1	All exposed surfaces, indoors and outdoors, except those included below.	Solvent cleaned SSPC-SP1 (4) aliphatic polyurethane
NFM-2	Aluminum surfaces in contact with concrete, or with any other metal except galvanized ferrous metal.	Solvent cleaned SSPC-SP1 (208) aluminum metal isolation
NFM-3	Polyvinyl chloride plastic piping, indoors and outdoors, or in structures, not submerged.	Solvent cleaned SSPC-SP1 (7) acrylic latex
NFM-4	Buried non-ferrous metal pipe.	Removal of dirt, grease, oil (200) PVC tape

3.17 COATING SYSTEM SCHEDULE-CONCRETE

<u>Item</u>	<u>Surface Prep.</u>	<u>System No.</u>
C-1	All surfaces indoors and outdoors, unless noted otherwise.	Per Paragraph 3.8 (11) aliphatic polyurethane, concrete

** END OF SECTION **

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SECTION 09 96 56
EPOXY LININGS AND COATINGS

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Requirements for surface preparation, application and testing of fusion-bonded epoxy lining and coating systems for ferrous surfaces of valves or pipeline appurtenances.
- B. Do not apply fusion-bonded epoxy systems to aluminum, brass, bronze, copper, plastic, rubber, or stainless steel surfaces.
- C. Where Owner deems fusion-bonded epoxy coatings to be impractical, liquid epoxy lining systems may be substituted as described herein.

1.2 RELATED WORK

- A. Section 01 30 00: Contractor Submittals
- B. Section 01 40 00: Quality Control
- C. Section 01 53 00: Protection of Existing Facilities
- D. Section 01 55 00: Site Access and Storage
- E. Section 01 60 00: Products, Materials, Equipment and Substitutions
- F. Section 09 90 00: Protective Coatings

1.3 SYSTEM DESCRIPTION

- A. Furnish and install complete functional coating system for specified surface in compliance with applicable local air quality management regulations. Comply with Manufacturer's application requirements and applicable codes and standards.
- B. The term "dry film thickness" or DFT shall refer to thickness of fully-cured paint coat measured in mils (1/1000")

1.4 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workmen trained and experienced in necessary trades and crafts and completely familiar with specified requirements and methods for proper performance of Work of this section.
- B. Cured lining or coating shall be smooth and glossy with no graininess or roughness. Lining or coating shall have no blisters, cracks, bubbles, under-film voids, mechanical damage, discontinuities or holidays.

C. Factory testing shall include:

ITEM	TEST FOR	TEST STANDARD (ASTM OR OTHER TEST STANDARD)	FREQUENCY	FIRST TEST PAID FOR BY	RETESTS PAID FOR BY
Offsite Surface Preparation and Priming	Offsite Inspection of Priming Operation	Applicable standards	As directed on	Contractor	Contractor
Paint from Proposed "equals"	Spectrographic and Durability Tests	Applicable ASTM standards	As directed	Contractor	Contractor
Valve or Pipeline Appurtenance Interior Lining or Exterior Coating	Visual Inspection	Pipe or items will be rejected due to: a). Any sizeable protrusion in lining obviously caused by lining over foreign material. b). Any defect indicating double flow or fold in lining. c). Any chuck marks or gouges extending to bare metal. d). Any bubble or area which appears to be unbonded to underlying metal surface	Each lined pipe spool or item	Contractor	Contractor
	Holidays	AWWA C213 Section 5.3.3 If less than one holiday per 10 square feet of pipe surface is found, repair per coating Manufacturer's recommendation and retest. If more holidays are found, sandblast, recoat and retest entire pipe spool. Also check weld seam centerlines to verify no porous blisters, craters or pimples lie along peak of weld crown.	Each lined pipe spool or item $\geq 16"$	Contractor	Contractor
		AWWA C213 Section 5.3.3. If number of holidays or pinholes for items $\leq 12"$ is ≤ 5 per item, repair per coating	Each lined valve, fitting or pipeline appurtenance	Contractor	Contractor

ITEM	TEST FOR	TEST STANDARD (ASTM OR OTHER TEST STANDARD)	FREQUENCY	FIRST TEST PAID FOR BY	RETESTS PAID FOR BY
		Manufacturer's recommendation and retest. If more holidays are found, sandblast, recoat and retest entire item.			
	Lining Thickness	Verify thickness with magnetic-type dry film thickness gauge. Average shall exceed minimum thickness, No individual thickness value shall be more than 2 mils below or 3 mils above specified minimum thickness. Items not meeting these criteria shall be sandblasted, recoated and retested.	Each lined pipe valve at three locations per item	Contractor	Contractor

1.5 REFERENCES

- A. ASTM D1002 Apparent Shear Strength of Single-Lap-Joint Adhesively Bonded Metal Specimens by Tension Loading (Metal-to-Metal)
- B. ASTM D1044 Resistance of Transparent Plastics to Surface Abrasion
- C. ASTM D2370 Tensile Properties of Organic Coatings
- D. ASTM D2583 Indentation Hardness of Rigid Plastics by Means of a Barcol Impressor
- E. ASTM G17 Penetration Resistance of Pipeline Coatings
- F. AWWA C210 Liquid Epoxy Coating Systems for Interior and Exterior of Steel Water Pipelines
- G. AWWA C213 Fusion-Bonded Epoxy Coating for Interior and Exterior of Steel Water Pipelines
- H. AWWA C550 Protective Epoxy Interior Coatings for Valves and Hydrants
- I. AWWA C620 Spray-Applied In-Place Epoxy Lining of Water Pipelines 3" and Larger
- J. MSS SP98 Protective Coatings for Interior of Valves, Hydrants, and Fittings
- K. SSPC PA1 Shop, Field and Maintenance Painting
- L. SSPC PA2 Measurement of Dry Paint Thickness with Magnetic Gauges
- M. SSPC SP5/NACE 1 White Metal Blast Cleaning
- N. SSPC SP10/NACE 2 Near White Blast Cleaning
- O. SSPC Vis1 Pictorial Surface Preparation Standards for Painting Steel Surfaces

1.6 SUBMITTALS

- A. Furnish the following submittals.

SUBMITTAL	DESCRIPTION	
Catalog Data	Submit product data sheets per catalog data requirements.	
Application Instructions	Required for each paint and coating per application instruction requirements. Include <ol style="list-style-type: none"> 1. Surface Preparation Requirements. 2. MSDS sheets identifying flammability, toxicity, allergenic properties and any other characteristics requiring field precautions. 3. Minimum and maximum recommended dry-film thicknesses per coat for prime, intermediate, and finish coats. 4. Percent solids by volume. 5. Statement verifying selected prime coat is recommended by Manufacturer for use with selected intermediate and finish coats. 6. Application and curing requirements and instructions. 	
Certificate of Compliance	<ol style="list-style-type: none"> 1. For work done in California, submit certification that all coatings conform to applicable local Air Quality Management District rules and regulations for products and application 2. Submit coating system and application certification that coatings comply with specified requirements and are suitable for intended application per certificate of compliance requirements. 3. Submit description of repair procedures used if any. 	
Warranty	Furnish one-year warranty from date of final acceptance	

- B. Refer to Section 01 30 00 for definition of requirements for catalog data, application instructions, and certificates of compliance.

1.7 DELIVERY, STORAGE AND HANDLING

- A. Refer to contract documents for delivery, storage, and handling requirements.

1.8 PAYMENT

- A. Payment for Work in this section shall be included as part of the lump-sum for Bid Item No. 1.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. All materials shall be those of current manufacture and shall meet all applicable regulations for the application and intended service. All materials shall meet all applicable Federal, state and local regulations, including Air Quality Management District Regulations. All coats of any particular coating system shall be of same Manufacturer and shall be approved by Manufacturer for the intended service. If product specified herein is no longer manufactured or does not meet current regulations, Contractor shall provide a substitute, currently manufactured product of at least equal performance which meets all applicable regulations subject to Owner's Representative's approval, at no additional cost.

B. Factory-applied base coatings to a specific product may differ slightly from those listed below where primers are factory-applied by Manufacturers. Such base-coat substitutions for Contractor's convenience are subject to the following stipulations.

1. Surface preparation shall meet or exceed surface preparations specified below.
2. Primer or base coat shall be that recommended and normally used by Manufacturer for condition and exposure of finished installation.
3. Chemical composition of factory-applied base coats shall be similar to chemical composition specified below.
4. If different coating system is recommended by Manufacturer to meet performance specifications of other sections, Manufacturer shall notify Contractor in writing and said notice shall be forwarded to Owner's Representative.
5. Contractor shall verify compatibility of adjacent coats with coating Manufacturers.
6. Total DFT shall equal or exceed DFT specified below.
7. Finish coat shall be as stipulated below.
8. If paint system fails, Contractor shall repair paint system in failed area to specifications of this section.

C. Acceptable Manufacturers for fusion-bonded include:

ITEM	MANUFACTURER	MANUFACTURER LOCATION
Fusion-Bonded Epoxy Linings and Coatings	3M Scotchkote 134, 135, 203, 206, 206N or 6233	Saint Paul, MN
	Akzo Nobel	Nashville, TN
	Northtown Keysite 740	Huntington Beach, CA
	Valspar "Pipe Clad" 1500 Red	Indianapolis, IN
	Accepted equal	

D. Acceptable Manufacturers for field-applied epoxy coating for patching include:

ITEM	MANUFACTURER	MANUFACTURER LOCATION
Field-Applied Liquid Epoxy Linings and Coatings for Patching	3M Scotchkote 306	Saint Paul, MN
	Accepted equal	

E. Acceptable Manufacturers for liquid epoxy include:

ITEM	MANUFACTURER	MANUFACTURER LOCATION
Liquid Epoxy Linings and Coatings	3M Scotchkote 312 or 314	Saint Paul, MN
	ICI Devoe - Sinclair - ICI Dulux Paint Div. Glidden Co. Bar Rust 233 series	Cleveland, OH
	Tnemec Pota-Pox L69	Kansas City, KS
	Accepted equal	

2.2 MATERIALS - GENERAL

- A. Refer to Section 01 60 00 for basic requirements for products and materials.
- B. Fusion-bonded epoxy lining systems for valves, piping, and pipe appurtenance interiors shall meet the following requirements.

ITEM	MATERIAL	SPECIFICATION	ALTERNATE SPECIFICATION*
Valves, Pipeline, and Pipeline Appurtenance Interior Lining or Exterior Coating	Fusion-Bonded Epoxy	AWWA C213 100% solids powdered thermosetting epoxy per AWWA C550 Hardness per ASTM D2583: Barcol 17 Hardness on "M" Scale: Rockwell 50 Abrasion Resistance per ASTM D1044 with Tabor CS17 wheel 1000-gram wheel, 1000 cycles: 0.05 gram removed / 5000 cycles 0.115 gram removed Adhesion 3,000 psi (Elcometer) Tensile Strength per ASTM D2370: 7300 psi Penetration per ASTM G17: 0 mil Adhesion Overlap Shear, 1/8" steel panel, 0.010 glue line per ASTM D1002: 4300 psi Impact (100 in-lb minimum (Gardner 3/8" diameter tip) Total DFT 24.0 mils	
Surface Preparation		SSPC-SP5/NACE 1 White metal blast cleaning	

- C. Field-applied epoxy coating for patching shall meet the following requirements.

ITEM	MATERIAL	SPECIFICATION	ALTERNATE SPECIFICATION*
Valves, Pipeline or Pipeline Appurtenance Interior Lining or Coating	Epoxy	80% solids liquid resin Total DFT 24.0 mils	
Patching Compound	Polyamide Epoxy	Scotchkote 323	

- D. Liquid epoxy lining systems for valves, pipeline, and pipeline appurtenance interiors shall be used only when Owner deems fusion-bonded epoxy coating to be impractical. Liquid epoxy lining systems for valves, pipeline and pipeline appurtenance interiors shall meet the following requirements.

ITEM	MATERIAL	SPECIFICATION	ALTERNATE SPECIFICATION	ALTERNATE SPECIFICATION
Valves, Pipeline or Pipeline Appurtenance Interior Lining or Coating	Epoxy	Total DFT 16.0mils		
Surface Preparation		SSPC-SP5/NACE 1 White metal blast cleaning		

ITEM	MATERIAL	SPECIFICATION	ALTERNATE SPECIFICATION	ALTERNATE SPECIFICATION
Base Coat (Apply at Place of Manufacture)	Polyamide Epoxy	Tnemec Pota-Pox L69 DFT 4.0-5.0 mils,	3M Company Epoxy Primer DFT 4.0-5.0 mils,	ICI Devoe Bar-Rust 233V DFT 5.0-6.0 mils
Intermediate Coat (Apply at Place of Manufacture)	Polyamide Epoxy	Tnemec Pota-Pox L69 DFT 4.0-5.0 mils,	3M Scotchkote 312 or 314 DFT 4.0-5.0 mils,	ICI Devoe Bar-Rust 233V DFT 4.0-5.0 mils,
Finish Coat (Apply at Place of Manufacture)	Polyamide Epoxy	Tnemec Pota-Pox L69 DFT 4.0-5.0 mils,	3M Scotchkote 312 or 314 DFT 4.0-5.0 mils,	ICI Devoe Bar-Rust 233V DFT 4.0-5.0 mils,

PART 3 - EXECUTION

3.1 PREPARATION

- A. All surfaces to be coated or painted shall be in proper condition to receive material specified before any coating or painting is done.
- B. Prepare iron or steel surfaces in accordance with applicable Manufacturer's instructions and SSPC standards.
- C. Grind surface irregularities, welds, and weld spatter smooth before applying epoxy. Remove all protuberances including slivers, scales, burrs and gouges which may produce pinholes in lining. Grind at least 0.020" off weld caps on pipe weld seams before beginning surface preparation and heating of pipe. Round all sharp edges to be coated.
- D. Allowable grind area shall not exceed 0.5 square feet per location and maximum grind area shall not exceed 2 square feet per item or piece of equipment. Do not use items, pipes or pieces of equipment not meeting these requirements.
- E. Ensure surfaces to receive coatings are dry and free from visible oil, grease, dirt, dust, mill scale, rust, paint oxides, corrosion products and other foreign matter in accordance with specified SSPC standards.
- F. Preheat pipe, item or piece of equipment prior to blast cleaning to remove surface moisture. Preheat shall ensure surface temperature is at least 5°F above dew point temperature during blast cleaning and inspection.
- G. Sandblast surfaces as specified, protecting beveled pipe ends from abrasive blast cleaning.
- H. After sandblasting, apply 5% (by weight) phosphoric acid solution wash to pipe, item or piece of equipment. Average temperature measured in three different locations

shall be between 80°F and 130°F during acid wash procedure. Duration of acid contact with surface shall be as follows:

Temperature	Contact Time
80°F	52 seconds
85°F	45 seconds
90°F	36 seconds
95°F	33 seconds
100°F	28 seconds
105°F	24 seconds
110°F	21 seconds
130°F	10 seconds

- I. After completing acid wash, remove acid with demineralized water having maximum conductivity of 5 micromhos/cm at a minimum nozzle pressure of 2500 psi.

3.2 APPLICATION

- A. Furnish and install fusion-bonded epoxy linings and coatings at locations shown on Plans and Submittals.
- B. The following installation standards shall be followed:
 1. Manufacturer's installation and warranty requirements including minimum and maximum drying time between required coats, except as modified herein
 2. Applicable OSHA and Cal OSHA regulations
 3. AWWA C213 Fusion-Bonded Epoxy Coating for Interior and Exterior of Steel Water Pipelines
- C. Refer variances between above documents and Contract Documents to Owner's Representative.
- D. Coat interior metal surfaces excluding seating areas and bronze and stainless-steel pieces.
- E. Uniformly apply coatings at spreading rate required to achieve specified DFT.
- F. Apply coatings to be free of film characteristics such as runs or blisters that would adversely affect performance or appearance of coating systems.
- G. Apply lining and coating by electrostatic spray or fluidized bed process. Heat and cure per epoxy Manufacturer's recommendations. Heat source shall not leave residue or contaminant on metal surface. Do not allow surfaces to oxidize or flash rust prior to coating.
- H. Pinholes and holidays detected during testing shall be marked, repaired in accordance with Manufacturer's printed instructions and retested. No pinholes or other irregularities will be permitted in final coating.

- I. Protect finished surfaces between coats. For subsequent coats, remove dust, dirt, oil, grease, and any foreign matter which will affect adhesion or durability of finish by washing with clean rags dipped in commercial cleaning solvent approved by paint and coating system Manufacturer. Surface shall then be rinsed with clean water and wiped dry with clean rags.
- J. Coats shall be thoroughly dry and cured according to Manufacturer's recommendations before next coat is applied.
- K. Upon completion, remove masking and other temporary coverings and protection of surrounding areas and surfaces.
- L. Following application and testing, protect surfaces of coating systems from damage during construction.

3.3 FIELD QUALITY CONTROL

- A. Repair or replace damaged or colored materials and surfaces not scheduled to be coated.
- B. Repair in accordance with Manufacturer's instructions coatings that exhibit film characteristics or defects that might adversely affect performance or appearance of coating systems. Wire brush or sandblast damaged areas per SSPC SP10. Lightly abrade or sandblast lining and coating on sides of damaged area before applying liquid repair coating specified above. Patched areas shall overlap parent or base coating at least 1/2". If damaged area exceeds 20 square inches, remove entire lining and coating and recoat and retest entire item.
- C. Field testing shall include:

ITEM	TEST FOR	TEST STANDARD (ASTM OR OTHER TEST STANDARD)	FREQUENCY	FIRST TEST PAID FOR BY	RETESTS PAID FOR BY
Finished Lining or Coating	Holidays	Nondestructive holiday tester such as Tinker-Razor Model AP or AP-W Contractor to submit written report from approved testing agency on re-inspection	Owner's option	Owner	Contractor
	Dry Film Thickness	SSPC-PA2 Nondestructive magnetic-type thickness gauge such as "Inspector" or "Positest." Coated items failing inspection will be subject to rejection.	Owner's option	Owner	Contractor
	Film characteristics and defects	Visual inspection. Contractor to submit written report from approved testing agency on re-inspection	As directed	Owner	Contractor

ITEM	TEST FOR	TEST STANDARD (ASTM OR OTHER TEST STANDARD)	FREQUENCY	FIRST TEST PAID FOR BY	RETESTS PAID FOR BY
Finished Coating System	11-Month Warranty Inspection	Demonstrate compliance to Contract Documents and Manufacturer's printed literature as described below. Repair identified deficiencies.	1 inspection attended by Owner, Contractor, Owner's Representative and Manufacturer's representative	Owner	Contractor

- D. Contractor shall furnish inspection devices in good working condition for detection of holidays and measurement of dry-film thickness of paints and coatings. Contractor shall also furnish U.S. Department of Commerce, National Bureau of Standards certified thickness calibration plates to test accuracy of thickness gauges. Dry film thickness gauges and holiday detectors shall be available at all times until final acceptance of application. Inspection devices shall be operated by, or in presence of Owner's Representative with location and frequency basis determined by Owner's Representative. Owner's Representative is not precluded from furnish his own inspection devices and rendering their opinion based solely on their tests.
- E. Owner's Representative shall have right to reject all unsatisfactory material or work and to replace it at Contractor's expense if any deficiency is found in quality of installed coating.
- F. Upon completion of work, remove all staging, scaffolding and containers from Work site. Clean site to satisfaction of Owner's Representative.
- G. Warranty Inspection shall be conducted between eleventh month following completion of all coating and painting work. Repair all defective work in strict accordance with Contract Documents and to satisfaction of Owner's Representative.
1. Owner will establish inspection date and will notify Contractor at least 30 days in advance. Owner will uncover or otherwise expose surfaces to be inspected. Contractor shall provide at his expense suitable lighting and ventilation for inspection. Contractor shall provide all other necessary inspection equipment to Owner's satisfaction.
 2. Entire interior coating system shall be visually inspected. All defective coatings as well as damaged or rusting spots shall be satisfactorily repaired by and at sole expense of Contractor. All repaired areas shall then be tested as specified herein and repair/testing procedure repeated until surface meets specified requirements.
 3. Entire exterior paint system shall be visually inspected. All defective, damaged or rusting areas shall be satisfactorily repaired by and at sole expense of Contractor.
 4. Warranty Inspection Report will be prepared by Owner's Representative and delivered to Contractor. It will set forth number and type of failures

observed, percentage of surface area where failure has occurred, and names of persons making inspection.

5. Repairs shall proceed promptly. Upon completion of inspection and receipt of Inspection Report, Owner will establish date for Contractor to proceed with remedial Work. Delay on part of Contractor to proceed with remedial work on schedule shall constitute breach of this Contract. In such case, Owner may proceed to have defects remedied as outlined in Contract Documents.
6. Remedial Work shall occur at any location where paint or coating has peeled, bubbled, or cracked and at any location where rusting is evident. All such locations shall be considered failures. Contractor shall make repairs at all points where failures are observed by removing deteriorated coating or paint , cleaning surface and repainting or recoating with same system. If area of failure exceeds 25% of any coated or painted surface, entire paint or coating system shall, at Owner's option, be required to be removed and recoated or repainted in accordance with original Contract Documents.
7. Costs of warranty inspection and repair shall be borne by Contractor, who shall include an appropriate amount for testing and repair in their bid. No additional allowance will be paid by Owner for Warranty Inspection and repairs.

**** END OF SECTION ****

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**SECTION 23 05 93
TESTING, ADJUSTING AND BALANCING FOR HVAC**

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Testing, adjusting and balancing (TAB) of ventilating system to produce design objectives specified.

1.2 RELATED WORK

- A. Section 01 30 00: Contractor Submittals
- B. Section 01 40 00: Quality Control
- C. Section 01 53 00: Protection of Existing Facilities
- D. Section 01 55 00: Site Access and Storage
- E. Section 01 60 00: Products, Materials, Equipment and Substitutions
- F. Section 23 34 00: HVAC Fans

1.3 SYSTEM DESCRIPTION

- A. Testing, adjusting and balancing shall consist of regulating fluid flow rate and air patterns at terminal equipment including adjustment of dampers or fan speeds in order to best achieve design objectives.

1.4 QUALITY ASSURANCE

- A. Engage a TAB firm certified by AABC.
- B. Certify TAB field data reports. Review field data reports to verify accuracy of data and to prepare certified TAB reports. Certify that the TAB team complied with the approved TAB plan and the procedures specified herein.
- C. Prepare TAB reports on standard forms of AABC.
- D. Instrumentation type, quantity and accuracy shall be as described in AABC's "National Standards for Testing and Balancing Heating, Ventilating and Air Conditioning Systems."
- E. Instruments used by Contractor to test the HVAC system performance shall be calibrated in conformance with the instrument manufacturer's recommendations.
- F. Use adequate numbers of skilled workmen trained and experienced in necessary trades and crafts and completely familiar with specified requirements and methods for proper performance of Work of this section.

1.5 REFERENCES

- A. AABC National Standards for Testing and Balancing Heating, Ventilating and Air Conditioning Systems.

1.6 SUBMITTALS

A. Furnish the following submittals.

SUBMITTAL	DESCRIPTION	
Qualification Data	Within 45 days from Notice to Proceed, submit evidence Testing, Adjusting and Balancing contractor is AABC certified.	
Instrument Calibration Data	On owner's request, submit current record of instrument calibration indicating date of calibration and name of party performing instrument calibration.	
Certified TAB Reports	Submit two copies of reports prepared as specified herein on AABC approved forms certified by TAB firm. This report is described below in more detail.	

B. Final report shall be computer printed in letter quality font on standard bond paper. Furnish report in three-ring binder, tabbed and divided into sections by tested and balanced systems. All pages shall be numbered. Use standard AABC or NEBB test forms where applicable. Report shall include the following:

1. First sheet shall be Title Page, with signed and sealed certification by certified testing and balancing engineer. Title page shall also show name and address of TAB firm, project name and location, report date, and names and addresses of Owner and Contractor.
2. Include Table of Contents with page numbers for each report section.
3. Include list of instruments used during TAB along with proof of calibration.
4. Include summary of contents including indicated versus final performance, notable characteristics of systems and description of operation sequence.
5. Include nomenclature sheets for each item of equipment. Sheets shall include name of device, Manufacturer's name, date of calibration and correction factors.
6. Include data for terminal units, including Manufacturer, type and size of fittings.
7. Include fan curves.
8. Include test settings for controllers.
9. Include motor data including the following:
 - a. Make and frame type and size.
 - b. Horsepower and rpm
 - c. Volts, phase and Hertz
 - d. Full load amperage and service factor
 - e. Sheave make, size in inches and bore
 - f. Sheave dimensions, center-to-center and amount of adjustments in inches.

10. Include notes explaining why certain final data in body of reports varies from indicated values.
11. Include Manufacturers' test data.
12. Include test conditions for fan and pump performance forms including fan drive settings, percentage of maximum pitch diameter and other system operating conditions affecting performance.
13. Include certified field test report data on approved AABC forms. Test data shall show indicated and actual values for the following:
 - a. Total airflow in cfm.
 - b. Total system pressure in inches wg.
 - c. Fan rpm.
 - d. Discharge static pressure in inches wg.
14. Other information relative to equipment performance but not including shop drawings or product data.

1.7 PROJECT CONDITIONS

- A. Owner may occupy completed areas of construction before Substantial Completion. Cooperate with Owner during TAB operations to minimize interference with Owner's operations.

1.8 WARRANTY

- A. National Project Performance Guarantee: Provide guarantee on AABC's "National Standards for Testing and Balancing Heating, Ventilating and Air Conditioning Systems" forms stating AABC will assist in completing requirements of the Contract Documents if TAB firm fails to comply with Contract Documents. Guarantee includes the following provisions:
 1. The certified TAB firm has tested and balanced systems according to Contract Documents.
 2. Systems are balanced to optimum performance capabilities within design and installation limits.

1.9 PAYMENT

- A. Payment for Work in this section shall be included as part of the lump-sum for Bid Item No. 1.

PART 2 - PRODUCTS

2.1 ACCEPTABLE TESTING ADJUSTING AND BALANCING (TAB) FIRMS

- A. TAB consultant shall be certified by AABC.

2.2 MATERIALS

- A. Test holes (if required) shall be a manufacturer's standard product constructed of cast aluminum with gasketed screw cap and base.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Examine Contract Documents and Project Record Documents to become familiar with project requirements and to discover conditions in systems designs that may preclude proper TAB of systems and equipment.
- B. Prior to beginning testing and adjusting, contact equipment manufacturers and obtain and review any data required for TAB including adjusting, balancing or operating instructions.
- C. Notify Owner's Representative at least three working days prior to performing tests and final adjustments. At that time, clarify with Owner's Representative any questions regarding expected system performance.
- D. Comply with applicable OSHA and Cal OSHA Regulations.
- E. Furnish required test instruments including:
 - 1. Velometer with probes and pitot tube.
 - 2. Rotating vane anemometer, 4-inch size.
 - 3. ASRAE standard pitot tubes, stainless steel, 5/16" outside diameter, 18 inches and 36 inches long.
 - 4. Differential air pressure gages, 0-0.5 inch wg, 0-1 inch wg, and 0-5 inches wg, each arranged as portable unit for use with standard pitot tube.
 - 5. Combination inclined-vertical portable manometer, range 0-5 inches wg.
 - 6. Portable hook gage, range 0-12 inches wg.
 - 7. Portable flexible u-tube manometer, magnetic mounting clips, range 0-18 inches wg.
 - 8. Hydronic system balance instrument shall read pressure differential across flow balance valves with a maximum range of 0-100 feet of water at 0.5% accuracy.
- F. Install test holes at inlet and outlet of all air handling unit fans, exhaust fans, utility fans and elsewhere as required to facilitate traverses and to test air systems.

- G. Report deficiencies discovered before and during performance of TAB procedures. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.

3.2 ADJUSTING AND CLEANING

- A. Perform TAB procedures on each system according to the procedures contained in the AABC's "National Standards for Testing and Balancing Heating, Ventilating and Air Conditioning Systems" and this section.
- B. Take and record testing and balancing measurements in inch-pound units.
- C. Test and adjust supply, return, exhaust and relief fan rpm's to design requirements within limits of mechanical equipment provided. Change v-belt drive assemblies as needed to balance system to design airflows.
- D. Set fan airflow rates to within minus five to plus 10%.
- E. Do not use register shutters or dampers for balancing. Leave them wide open while balancing system. Adjust flow patterns from terminal units as shown on drawings.
- F. Close dampers and test for leakage. If leakage exceeds 6% of design volume, reset damper linkage or replace damper.

3.3 FIELD QUALITY CONTROL

- A. Field testing shall include the following:

ITEM	TEST FOR	TEST STANDARD (ASTM OR OTHER TEST STANDARD)	FREQUENCY	FIRST TEST PAID FOR BY	RETESTS PAID FOR BY
Fans	Operation	AABC Standards	Each fan	Contractor	Contractor
Hydronic Piping	Operation	See above	Each system	Contractor	Contractor
Temperature Controllers	Operation	AABC Standards	Each controller	Contractor	Contractor

- B. Prepare test reports for fans. Obtain manufacturer's recommended testing procedures. Measure, adjust and record airflow of each fan including fans in package HVAC units.

**** END OF SECTION ****

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**SECTION 23 34 00
HVAC FANS**

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Materials, testing, and installation of a new Supply Fan and new Exhaust Fan (and appurtenances) for ventilating the Pump Room.
- B. The odorous air fan that is part of the odor treatment system is covered in Section 44 31 00.

1.2 RELATED WORK

- A. Section 01 30 00: Contractor Submittals
- B. Section 01 40 00: Quality Control
- C. Section 01 53 00: Protection of Existing Facilities
- D. Section 01 55 00: Site Access and Storage
- E. Section 01 60 00: Products, Materials, Equipment and Substitutions
- F. Section 09 90 00: Protective Coatings
- G. Section 09 96 56: Epoxy Linings and Coatings
- H. Section 23 05 93: Testing, Adjusting and Balancing
- I. Section 44 31 00: Odor Treatment Equipment

1.3 SYSTEM DESCRIPTION

- A. Furnish and install complete operating fans as shown on Plans including appurtenant structural, mechanical and/or electrical mountings or connections required for compliance with Manufacturer's installation requirements and compliance with applicable building codes and standards.
- B. Fan control system input control variables shall include the following:

ITEM	VARIABLE	DESCRIPTION
Supply Fan	H-O-A switch and Limit Switch at Pump Room Access Hatch	<p>This fan is subject to two modes of control (per the electrical dwgs):</p> <p><u>Mode 1:</u> Automatic operation by an H-O-A switch and a limit switch at the Pump Room access hatch. Fan is subject to automatic control by the limit switch when placed in "Automatic" position. Fan is ON when this hatch is opened; Fan is OFF when this hatch is closed.</p> <p><u>Mode 2:</u> Manual operation using the H-O-A switch: Fan is ON when placed in "Hand"; Fan is OFF when placed in "OFF".</p> <p>Fan Speed: When ON, this fan operates at constant speed.</p>

ITEM	VARIABLE	DESCRIPTION
Exhaust Fan	H-O-A switch and Limit Switch at Pump Room Access Hatch	<p>This fan is subject to two modes of control (per the electrical dwgs);</p> <p><u>Mode 1:</u> Automatic operation by an H-O-A switch and a limit switch at the Pump Room access hatch. Fan is subject to automatic control by the limit switch when placed in "Automatic" position. Fan is ON when this hatch is opened; Fan is OFF when this hatch is closed.</p> <p><u>Mode 2:</u> Manual operation using the H-O-A switch: Fan is ON when placed in "Hand"; Fan is OFF when placed in "OFF".</p> <p>Fan Speed: This fan shall have variable speed control so that its air flow rate can be reduced to cause it to operate at a lower output than the Supply Fan. The purpose of that differential in fan output is to slightly raise air pressure in the Pump Room so that any air leakage that does occur at the wetwell access hatches will be air movement into the wetwell instead of movement of odorous air from the wetwell into the Pump Room.</p> <p>Fan operating speed shall be manually adjustable by means of a switch (or knob) that is an integral feature of the motor. A separate VFD is not acceptable to achieve this variable speed capability.</p>

- C. An H-O-A switch is located beneath the Pump Room access hatch; it is in a location near the top of the stairs that provide entry into the Pump Room. This H-O-A switch controls operation of the Supply Fan and Exhaust Fan.
- D. Ventilation normal start sequence shall trigger a circuit to turn equipment ON when any of the following conditions occur:
 - 1. When the H-O-A switch is in the "Automatic" position, and the Pump Room access hatch limit switch indicates the Pump Room access hatch is OPEN, the Supply Fan and Exhaust Fan shall turn ON. The Supply Fan will operate at constant speed. The Exhaust Fan will operate at the speed determined by a manual switch (or knob) that is integral to the fan motor.
 - 2. When the H-O-A switch is set to "Hand" position, the Supply Fan and Exhaust Fan shall turn ON regardless of whether or not the Pump Room access hatch is OPEN or CLOSED. Both fans will continuously operate when in this control mode.
- E. Ventilation normal shut down sequence shall shut down equipment when any of the following conditions occur:
 - 1. When the H-O-A switch is in the "Automatic" position, and the Pump Room access hatch limit switch indicates the Pump Room access hatch is CLOSED, the Supply Fan and Exhaust Fan shall turn OFF.
 - 2. When the H-O-A switch is set to "Off" position, the Supply Fan and Exhaust Fan shall turn OFF regardless of whether or not the Pump Room access hatch is OPEN or CLOSED.

1.4 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workmen trained and experienced in necessary trades and crafts and completely familiar with specified requirements and methods for proper performance of Work of this section.
- B. Fans shall bear AMCA certified ratings seal for both air and sound performance.
- C. Dynamically and statically balance fan wheels and propellers at factory per AMCA 204.
- D. Factory testing shall include the following:

ITEM	TEST FOR	TEST STANDARD (ASTM OR OTHER TEST STANDARD)	FREQUENCY	FIRST TEST PAID FOR BY	RETESTS PAID FOR BY
Fans	Factory Test Procedures	AMCA 300	Certified rating for each fan type	Contractor	Contractor
	Sound Power Level	AMCA 301 and AMCA 302	Certified rating for each type of fan	Contractor	Contractor
	Vibration	Fan and shaft assembly shall not pass through critical speed as unit comes up to rated rpm.	1 each fan	Contractor	Contractor
	Aerodynamic Performance Ratings (Flow rate, pressure, power, air density, rotation speed, efficiency)	AMCA Bulletin 210	1 test each unit	Contractor	Contractor
Fan Motors	Amperage Draw	Damper fan from free-flow to no-flow operation and record amperage draw at 6 points.	1 test each fan	Contractor	Contractor
Fan	Operation	Demonstrate compliance to Contract Documents and Manufacturer's printed literature	1 test each unit	Contractor	Contractor

1.5 REFERENCES (use latest edition of each standard)

- A. AMCA 99 Standard Handbook
- B. AMCA 200 Air Systems
- C. AMCA 201-90 Fans and Systems
- D. AMCA 202-88 Troubleshooting
- E. AMCA 203-90 Field Performance Measurement of Fan Systems
- F. AMCA 204 Balance Quality and Vibration Levels for Fans
- G. AMCA 210 Laboratory Methods of Testing Fans for Aerodynamic Performance Rating
- H. AMCA 211 Certified Ratings Program-Product Rating Manual for Fan Air Performance
- I. AMCA 300 Reverberant Room Method for Sound Testing of Fans

- J. AMCA 301 Methods for Calculating Fan Sound Ratings from Laboratory Test Data
- K. AMCA 302 Application of Sone Ratings for Non-Ducted Air Moving Devices
- L. AMCA 311 Certified Ratings Program-Product Rating Manual for fan Sound Performance
- M. AMCA 99-0401 Classification for Spark
- N. ANSI ABMA 9 Load Ratings and Fatigue Life for Ball Bearings
- O. ASTM A653 Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
- P. ASTM B88 Seamless Copper Water Tube
- Q. California Mechanical Code (CMC)
- R. California Title 24 Building Efficiency Standards
- S. NEMA/ANSI 250 Enclosures for Electrical Equipment
- T. NFPA 70 National Electric Code
- U. NFPA 90A Installation of Air Conditioning and Ventilating Systems
- V. SMACNA HVAC Duct Construction Standards (Metal and Flexible)
- W. SMACNA HVAC Duct Systems Inspection Guide
- X. SMACNA Seismic Restraint Manual Guidelines for Mechanical Systems

1.6 SUBMITTALS

A. Furnish the following submittals.

SUBMITTAL	DESCRIPTION	
Shop Drawings	Dimensional drawings as required for electrically powered equipment under electrically powered equipment shop drawing requirements.	
Static Pressure Calculations	Submit calculations that indicate the static pressure requirements for each fan. Owner will inform Contractor how to proceed with fan procurement if these calculations indicate the design static pressure should be revised from what is specified herein.	
Catalog Data	Required per catalog data requirements. Submit fan curves and test reports for each type and size of fan showing compliance	
Fan Curves	Required for each fan at the specified operation point, with the flow, static pressure and horsepower clearly plotted.	
Sound Power	Provide outlet velocity and fan's inlet sound power readings for the eight octave bands, decibels, and sones.	
Installation Instructions	Required per installation or application instruction requirements including spare parts list	
O & M Instructions	Required per operation and maintenance instruction requirements.	
Certificate of Compliance	Fans shall bear AMCA rating seal and certify unit has been tested and rated in accordance with applicable AMCA test code and certified rating program	
Test Record Transcripts	Submit for factory tests per test record transcript requirements.	
Motor Data	Required per motor data requirements of Section 26 05 10.	
Warranty	Furnish one-year warranty from date of final acceptance	

B. Refer to Section 01 30 00 for definition of requirements for shop drawings, catalog data, installation instructions, O&M instructions, and test record transcripts.

1.7 QUALITY ASSURANCE

A. Performance Ratings: Conform to AMCA Standard 211 and 311. Fans must be tested in accordance with ANSI/AMCA Standard 210-16/ASHRAE 51-16 and AMCA

Standard 300 in an AMCA accredited laboratory. Fans shall be certified to bear the AMCA label for air and sound performance seal.

- B. Classification for Spark Resistant Construction shall conform to AMCA 99.
- C. Each fan shall be given a balancing analysis which is applied to wheels at the outside radius. The maximum allowable static and dynamic imbalance is 0.05 ounces (balance grade of G6.3).
- D. Comply with the National Electrical Manufacturers Association (NEMA) standards for motors and electrical accessories.

1.8 DELIVERY, STORAGE AND HANDLING

- A. Refer to Greenbook and Whitebook for requirements associated with the delivery, storage, and handling of equipment, materials and products that are furnished for installation as part of the WORK of this contract.
- B. Deliver motorized equipment as factory assembled unit to extent allowable by shipping limitations, with protective crating and covering.
- C. Disassemble and reassemble units as required for moving to final location according to Manufacturer's written instructions.
- D. Lift and support units with Manufacturer's designated lifting or supporting points.
- E. Manufacturer's instruction and warranty requirements for delivery, storage and handling of ventilation equipment shall be strictly followed.

1.9 PAYMENT

- A. Payment for Work in this section shall be included as part of the lump-sum for Bid Item No. 1.

PART 2 - PRODUCTS

2.1 ACCEPTABLE FAN MANUFACTURERS

- A. The table below lists fan manufacturing companies that market products that Owner has determined have good reputations in this industry. Fans furnished for this project shall be provided by one of the Acceptable Manufacturers listed below:

ITEM	MANUFACTURER	MANUFACTURER LOCATION
New Supply Fan	Acme Engineering & Manufacturing Corp.	Muskogee, OK
	Chicago Blower Corp.	Glendale Heights, IL
	Cincinnati Fan & Ventilator Co.	Mason, Ohio
	Greenheck Fan Corp.	Schofield, WI
	Hartzell Air Movement	Piqua, OH
	ILG Industries Inc./American Coolair Corp.	Jacksonville, FLA

ITEM	MANUFACTURER	MANUFACTURER LOCATION
	Loren Cook Company	Springfield, MO
	PennBarry	Plano, TX
	Accepted equal	
New Exhaust Fan	Acme Engineering & Manufacturing Corp.	Muskogee, OK
	Chicago Blower Corp.	Glendale Heights, IL
	Cincinnati Fan & Ventilator Co.	Mason, Ohio
	Greenheck Fan Corp.	Schofield, WI
	Hartzell Air Movement	Piqua, OH
	ILG Industries Inc./American Coolair Corp.	Jacksonville, FLA
	Loren Cook Company	Springfield, MO
	PennBarry	Plano, TX
	Accepted equal	
Odorous Air Fan (for odor control unit)	Hartzell Air Movement	Piqua, OH
	(this fan shall be as recommended by the Odor Control System manufacturer; see Spec Section 44 31 00)	
	Accepted Equal	

- B. Fans furnished shall operate throughout their full submitted curve range driven by motors of horsepower and full load amperages specified below and shown on Plans. Fans requiring larger motor than specified or shown are unacceptable in absence of written statement from Owner that the electrical infrastructure, drives and switchgear can support increased amperage.
- C. Electrical components, devices and accessories shall be listed and labeled as defined in NFPA 70, Article 100, by testing agency acceptable to local building code authorities. Electrical components, devices and accessories shall be marked for use intended.
- D. Air movement and control products shall comply with performance requirements and shall be labeled with and licensed to use AMCA Certified Ratings Seal.

2.2 GENERAL OPERATING CONDITIONS

- A. Refer to Section 01 60 00 for basic requirements for products and materials.
- B. Comply with California Energy Code Title 24 Building Efficiency Standards.
- C. Environmental factors are as follows”

ITEM	DESCRIPTION		
Fans Installed Indoors	Ambient	Air	40°F to 110°F
	Temperature		
	Relative Humidity		20%-80%
Fans Installed Outdoors	Ambient	Air	30°F to 120°F

ITEM	DESCRIPTION	
	Temperature	
	Relative Humidity	10%-100%

D. General Electrical Requirements are as follows:

ITEM	DESCRIPTION	
Electrical Work	NEC Article 505 Classification	Nonhazardous
Power Supply	Supply Fan	460VAC – 3-phase – 60Hz
	Exhaust Fan	208VAC – 1 phase – 60Hz

E. Sound power level ratings shall comply with AMCA 301. Factory test fans according to AMCA 300.

2.3 SUPPLY FAN

A. Supply Fan (Basis of Design): Supply fan shall be a Greenheck Model RSFP-150-7, or accepted equal. This is a belt-driven filtered louvered roof supply fan. This fan shall be rated for 3,500 cfm at 0.25 inches of static pressure. This fan shall be mounted on top of the pump station roof slab at the current location of the existing Exhaust Fan (which will be removed and replaced at a different location):

- Suction shall be 100% Outside air.
- Discharge shall be through an existing roof opening (Contractor shall verify the dimensions of this existing roof opening, and shall confirm its size is adequate for the selected supply fan).

B. General Description of the Supply Fan:

1. General Description:
 - a. Base fan performance on standard conditions (air density = 0.075 lb/ft³).
 - b. Louvered penthouse is a roof-mounted application.
 - c. Maximum continuous operating temperature is 130 degrees Fahrenheit (54.4 degrees C).
 - d. Each fan shall bear a permanently affixed manufacturer's engraved metal nameplate containing the model number and individual serial number.
2. Wheel:
 - a. Forward curved centrifugal wheel
 - b. Constructed of heavy gauge steel
 - c. Shall be a double width and double inlet
 - d. Statically and dynamically balanced in accordance with AMCA Standard 204-05
 - e. The wheel cone and fan inlet will be matched and shall have precise running tolerances for maximum performance and operating efficiency.
3. Motors:
 - a. Motor Enclosures: Open drip-proof

- b. Motors are permanently lubricated, heavy duty ball bearing type to match with the fan load and pre-wired to the specific voltage and phase.
- c. Mounted on vibration isolators, out of the air stream.
- 4. Shafts and Bearings:
 - a. Fan shaft shall be ground and polished solid steel with an anti-corrosive coating.
 - b. Permanently sealed bearings
 - c. Bearing shall be air handling quality pillow block.
 - d. Fan Shaft first critical speed is at least 25 percent over the maximum operating speed.
- 5. Hood:
 - a. Constructed of heavy gauge extruded aluminum louvers with mitered and welded corners
 - b. Includes an insulated aluminum cover hinged for access
 - c. Leak resistant
- 6. Housing Supports and Drive Frame:
 - a. Drive frame assemblies shall be constructed of heavy gauge steel and mounted on vibration isolators.
 - b. Lifting lugs shall be located on the drive frame to provide easy lifting
- 7. Vibration Isolation:
 - a. Double studded true isolators
 - b. No metal-to-metal contact
 - c. Sized to match the weight of each fan
- 8. Drive Assembly:
 - a. Belts, pulleys and keys oversized for a minimum of 150 percent of driven horsepower.
 - b. Belts shall be static free and oil resistant.
 - c. Pulleys: Cast type, keyed and securely attached to wheel and motor shafts
 - d. Motor pulleys are adjustable for final system balancing
 - e. Readily accessible for maintenance
- 9. Filters:
 - a. Washable aluminum one-inch filter factory standard; two-inch also available.
- 10. Curb Caps:
 - a. Includes pre-punched mounting holes to ensure correct attachment to roof
- 11. Roof Curb (Option/Accessory):
 - a. Type: GPI
 - b. Mounted onto roof with fan
 - c. Galvanized steel
 - d. Insulation thickness: 1 inch
 - e. Coating Type: none
- 12. Disconnect Switch (Option/Accessory):
 - a. NEMA rating: NEMA 3R
 - b. Positive Electrical Shut-off
 - c. Wired from fan motor to junction box

C. Key Characteristics of the Supply Fan shall be as summarized below:

ITEM	DESCRIPTION
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ITEM	DESCRIPTION
Rated Volume	3,500 cfm
Rated S.P.	0.25 inch water column
Fan RPM	465
Motor RPM	1785
Operating Power	0.59 hp
Motor Size	0.75 hp
Tip Speed	1,828 feet/minute
Static Efficiency	25 percent
Motor Voltage	460/60/3
Motor:	
• Motor Efficiency	High Efficiency rated
• Motor Enclosure	ODP
• Thermal Overload?	Yes
• UL/cUL 705 Listed?	Yes; as Power Ventilator
NEC FLA	1.6
Sound Power (Inlet)	65 dBA
Motor Drive	Belt-and-Sheave; constant speed
• Adjustable Motor Pulley?	Yes
• Adjustable Motor Plate?	Yes
Fan Wheel	Forward Curved Steel Fan Wheel
Materials of Construction:	
• Exterior Base Panels	Aluminum
• Louver Section	Aluminum
• Insulated Cover	Aluminum
• Filters	1 inch Washable Aluminum Filters
Blower and Motor Assembly Isolated on Shock Mounts?	Yes
Ball Bearing Motor?	Yes
Fan Shaft Mounted in Ball Bearing Pillow Blocks?	Yes
Static Free Belts?	Yes
Warranty	1 year (standard)

- D. Mounting Accessories and Appurtenances: Contractor shall furnish and install all accessories and appurtenances that are required for a complete and functioning fan installation. Provide roof curb, curb cap, ducting, anchor bolts, and other items as may be necessary to adapt the furnished fan to the existing roof inlet opening.
- E. Ferrous (steel) fan features shall be fusion bonded epoxy coated, or Owner-approved alternative.

2.4 EXHAUST FAN

- A. Exhaust Fan (Basis of Design): Exhaust fan shall be a Greenheck Model G-183-VG, or accepted equal. This is a direct drive roof downblast centrifugal exhaust fan. This fan shall be rated for 3,500 cfm at 0.50 inches of static pressure. This fan shall be mounted on top of the pump station roof slab near the current location of the existing Supply Fan (which will be removed and replaced at a different location):

- Suction shall be from the Pump Room; with 16-inch diameter PVC piping functioning as ductwork to convey air from a location near the floor of this room, to the fan suction.
- Discharge shall be to atmosphere (outside the lift station structure).

B. General Description of the Exhaust Fan:

1. General Description:
 - a. Base fan performance on standard conditions (air density = 0.074 lb/ft³).
 - b. Downblast fan shall be for roof mounted applications.
 - c. Maximum continuous operating temperature is 180 degrees Fahrenheit (82.2 degrees C).
 - d. Each fan shall bear a permanently affixed manufacturer's engraved metal nameplate containing the model number and individual serial number.
2. Wheel:
 - a. Non-overloading, backward inclined centrifugal
 - b. Constructed of aluminum
 - c. Shall be a double width and double inlet
 - d. Statically and dynamically balanced in accordance with AMCA Standard 204-05
 - e. The wheel cone and fan inlet will be matched and shall have precise running tolerances for maximum performance and operating efficiency.
3. Motors:
 - a. Motor shall be electronically commutated (for manual motor speed adjustment).
 - b. Motor Enclosures: Open type
 - c. Motor to be DC electronic commutation type motor (ECM) specifically designed for fan applications. AC induction type motors are not acceptable. Examples of unacceptable motors are: Shaded Pole; Permanent Split Capacitor (PSC); Split Phase; Capacitor Start and 3-phase induction type motors.
 - d. Motors are permanently lubricated, heavy duty ball bearing type to match with the fan load and pre-wired to the specific voltage and phase.
 - e. Internal motor circuitry to convert AC power supplied to the fan to DC power to operate the motor.
 - f. Motor shall be speed controllable down to 20% of full speed (80% turndown). Speed shall be controlled by a potentiometer dial mounted at the motor.
 - g. Motor shall be minimum of 85% efficient at all speeds.
4. Housing:
 - a. Motor cover, shroud, curb cap and lower windband shall be constructed of heavy gauge aluminum.
 - b. Shroud shall have an integral rolled bead for extra strength.
 - c. Shroud shall be drawn from a disc and direct air downward.
 - d. Lower windband shall have a formed edge for added strength.
 - e. Motor cover shall be drawn from a disc.
 - f. All housing components shall have a final thickness equal to or greater than preformed thickness.

- g. Curb cap shall have pre-punched mounting holes to ensure correct attachment.
- h. Rigid internal support structure.
- i. Leak proof.
- 5. Housing Supports and Drive Frame:
 - a. Drive Frame assembly shall be constructed of heavy gauge steel and mounted on vibration isolators.
- 6. Vibration Isolation:
 - a. Rubber isolators
 - b. Sized to match the weight of each fan.
- 7. Roof Curb (Option/Accessory):
 - a. Type: GPI
 - b. Mounted onto roof with fan
 - c. Galvanized steel
 - d. Insulation thickness: 1 inch
 - e. Coating Type: none
- 8. Disconnect Switch (Option/Accessory):
 - a. NEMA rating: NEMA 3R
 - b. Positive Electrical Shut-off
 - c. Wired from fan motor to junction box
- 9. Birdscreen:
 - a. Material Type: Aluminum
 - b. Protects fan discharge

C. Key Characteristics of the Exhaust Fan shall be as summarized below:

ITEM	DESCRIPTION
Rated Volume	3,500 cfm
Rated S.P.	0.50 inch water column
Fan RPM	Variable; but 1,037 rpm (at rated performance)
Maximum Motor RPM	1400
Operating Power	0.69 hp
Motor Size	2.0 hp
Tip Speed	5,021 feet/minute
Static Efficiency	40 percent
Motor Voltage	208/60/1
Motor:	Direct drive/variable speed with ECM motor
<ul style="list-style-type: none"> • Motor Type 	Vari-Green EC Motor with mounted Potentiometer Dial
<ul style="list-style-type: none"> • Motor Efficiency 	High Efficiency rated
<ul style="list-style-type: none"> • Motor Enclosure 	TEFC
<ul style="list-style-type: none"> • UL/cUL 705 Listed? 	Yes; as Power Ventilator
NEC FLA	12
Sound Power (Inlet)	65 dBA
Toggle Switch	NEMA 1, Shipped with unit
Junction Box	Mounted and Wired
Fan Wheel	Backward Inclined Wheel
Materials of Construction:	
<ul style="list-style-type: none"> • Housing 	Aluminum

ITEM	DESCRIPTION
• Curb Cap	Aluminum (with pre-punched holes)
• Insulated Cover	Aluminum
• Filters	1 inch Washable Aluminum Filters
• Fasteners	Corrosion Resistant
Motor Assembly Isolated on Shock Mounts?	Yes
Roof curb	Galvanized Steel; GPI-30-18-G12 (Undersized 1.5 inches total)
Tray Damper (shipped loose)	WD-100-PB-18x18; gravity operated; not coated
Birdscreen	Aluminum
Warranty	1 year (standard)

- D. Mounting Accessories and Appurtenances: Contractor shall furnish and install all accessories and appurtenances that are required for a complete and functioning fan installation. Provide roof curb, curb cap, ducting, anchor bolts, and other items as may be necessary to adapt the furnished fan to the existing roof inlet opening.
- E. Ferrous (steel) fan features shall be galvanized or coated per the contract documents.
- F. Contractor shall furnish and install suction ducting for the Exhaust Fan as indicated by the Contract Drawings. Ducting shall be 16-inch diameter Schedule 80 PVC pipe that will commence near the Pump Room floor and extend through an existing opening in the pump station roof slab to connect to the Exhaust Fan. Contractor shall furnish Type 316 stainless steel "offset pipe clamps" (Pipeline Products PS-OPC-16-4O-Q18373-316) to support the suction ducting from the Pump Room wall. Contractor shall modify the existing roof slab opening as required for proper support of the exhaust fan and proper connection of the suction duct to this fan.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Make field measurements needed to install ventilation equipment before submitting shop drawings or ordering. Make minor changes in dimensions and alignments as needed to avoid utilities or structural conflicts.
- B. Coordinate size and location of structural steel support members.
- C. Prepare the Pump Station roof slab in the area where each fan is to be installed, to accommodate the manufacturer's recommended installation configuration. Remove obstructions, repair the concrete surface, construct a new concrete equipment pad, or perform other surface preparation requirements as needed.
- D. Correct conditions detrimental to timely and proper completion of Work. Do not proceed until unsatisfactory conditions are corrected.

- E. Provide flashing including base flashing and counter flashing where items of this section penetrate roof, outer walls or waterproofing of any kind.

3.2 INSTALLATION

- A. Install ventilation equipment and ductwork to allow maximum possible headroom unless specific mounting heights are shown.
- B. Install equipment to facilitate service, maintenance and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations.
- C. The following installation standards shall be followed:
 - 1. Manufacturer's installation and warranty requirements
 - 2. Applicable OSHA and Cal OSHA regulations
 - 3. California Mechanical Code Chapter 5 "Exhaust Systems"
 - 4. Other applicable fire, mechanical and electrical code requirements
 - 5. NFPA 90A Installation of Air Conditioning and Ventilating Systems
- D. Refer variances between Manufacturer's installation instructions and Contract Documents to Owner's Representative.
- E. Install ventilation equipment to tolerances recommended by Manufacturer. Unless otherwise shown, install ventilation equipment true and level using precision gauges and levels.
- F. Cut fit and place miscellaneous mechanical supports accurately in location, alignment and elevation to support and anchor HVAC materials and equipment.
- G. Install fans and ventilators level and plumb with clearances for service and maintenance. Provide seismic restraint as required by CBC. Lubricate and balance fans per Manufacturer's requirements.
- H. Set roof-mounted fans on prefabricated roof curbs and isolate against vibration as shown or specified.
- I. Align motors, bases, shafts, pulleys and belts of motor driven equipment. Tension belts according to Manufacturer's installation instructions.
- J. After completing installation, internally clean fans according to Manufacturer's instructions. Remove foreign material and construction debris. Vacuum fan wheels and cabinets. Inspect exposed finish. Remove burrs, dirt and construction debris and repair damaged finishes.
- K. Provide thermostats with fans where shown or specified. Set thermostat to 80°F.

3.3 FIELD QUALITY CONTROL

A. Field testing shall include:

ITEM	TEST FOR	TEST STANDARD (ASTM OR OTHER TEST STANDARD)	FREQUENCY	FIRST TEST PAID FOR BY	RETESTS PAID FOR BY
Fans	Startup Checks	Verify shipping blocking & bracing are removed. Verify unit is securely mounted and connections to ducts and accessories are complete. Verify thermal overload protection is installed on motors. Verify thermostat set point and fan operation at set point Verify operation of fans when activated by wall switch and alarms. Verify cleaning & adjusting are complete With fan drive disconnected, verify proper motor rotation and fan free wheel rotation and bearing operation. Reconnect fan drive system. Align & adjust belts. Install belt guards.	All fans	Contractor	Contractor
	Starting Procedures	Energize motor & adjust fan to indicated rpm. Measure & record motor voltage & amperage. After energizing electrical circuitry, start units to confirm proper motor rotation and unit operation. Test and adjust controls and safeties. Shut unit down and reconnect automatic temperature control operators. Adjust belt tension. Lubricate bearings.	All fans	Contractor	Contractor
	Installation	Visual inspection of finished installation	1 inspection	Owner	Owner
	Balancing	Comply with applicable sections of Section 23 05 93.			
	Field Performance	Demonstrate compliance to Contract Documents and Manufacturer's printed literature	1 test	Contractor	Contractor
	11-month Warranty Inspection	Demonstrate compliance to Contract Documents and Manufacturer's printed literature	1 test	Owner	Contractor

B. Provide services of factory authorized representative on-site for minimum of one man-day (travel time excluded) to provide:

1. Installation assistance, inspection and startup of complete ventilation system.
2. Field testing and adjustment.
3. Instruction of Owner's personnel in operation and maintenance including starting and stopping, troubleshooting, servicing, and equipment maintenance schedules.

3.4 SPARE PARTS

- A. Furnish the following spare parts for centrifugal belt-driven in-line duct-mounted fans:

QUANTITY	PART
1	Set fan bearings
1	Set v-belts
1	Set shaft seals

** END OF SECTION **

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SECTION 26 05 19
LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:

1. Building wires and cables rated 2000 V and less.
2. Connectors, splices, and terminations rated 2000 V and less.

- B. Related Requirements.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 CONDUCTORS AND CABLES

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Alpha Wire Company.
2. Belden Inc.
3. General Cable Technologies Corporation.
4. Southwire Company.
5. Or Equal

- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

- C. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."
- D. Conductors: Copper, complying with NEMA WC 70/ICEA S-95-658.
 - 1. Conductor Insulation: Comply with NEMA WC 70/ICEA S-95-658 for Type THHN/THWN-2.

2.2 CONNECTORS AND SPLICES

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - 1. 3M Electrical Products.
 - 2. Hubbell Power Systems, Inc.
 - 3. Ideal Industries, Inc.
 - 4. ILSCO.
 - 5. O-Z/Gedney; a brand of Emerson Industrial Automation.
 - 6. Or Equal.
- B. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated; listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

- A. Feeders: Copper; solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.
- B. Branch Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

- A. Exposed Feeders: Type THHN/THWN-2, single conductors in raceway.
- B. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN/THWN-2, single conductors in raceway.
- C. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN/THWN-2, single conductors in raceway.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

- A. Conceal cables in finished walls, ceilings, and floors unless otherwise indicated.
- B. Complete raceway installation between conductor and cable termination points according to Section 26 05 33 "Raceways and Boxes for Electrical Systems" prior to pulling conductors and cables.
- C. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
- D. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips that will not damage cables or raceway.

3.4 CONNECTIONS

- A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.
- B. Make splices, terminations, and taps that are compatible with conductor material.
- C. Limit quantity of splices to reconnect existing loads only. All other wiring shall be continuous.
- D. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches (150 mm) of slack.

3.5 IDENTIFICATION

- A. Identify and color-code conductors and cables according to Section 26 05 53 "Identification for Electrical Systems."

3.6 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

- A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 26 05 44 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

3.7 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
 - 1. After installing conductors and cables and before electrical circuitry has been energized, test service entrance and feeder conductors and feeder conductors for compliance with requirements.
 - 2. Perform each of the following visual and electrical tests:

- a. Inspect exposed sections of conductor and cable for physical damage and correct connection according to the single-line diagram.
- b. Test bolted connections for high resistance.
- c. Inspect compression applied connectors for correct cable match and indentation.
- d. Inspect for correct identification.
- e. Inspect cable jacket and condition.
- f. Insulation-resistance test on each conductor with respect to ground and adjacent conductors. Apply a potential of 500-V dc for 300-V rated cable and 1000-V dc for 600-V rated cable for a one-minute duration.
- g. Continuity test on each conductor and cable.
- h. Uniform resistance of parallel conductors.

B. Cables will be considered defective if they do not pass tests and inspections.

C. Prepare test and inspection reports to record the following:

1. Procedures used.
2. Results that comply with requirements.
3. Results that do not comply with requirements and corrective action taken to achieve compliance with requirements.

**** END OF SECTION ****

**SECTION 26 05 26
GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes grounding and bonding systems and equipment.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

1.4 INFORMATIONAL SUBMITTALS

- A. As-Built Data: Plans showing dimensioned as-built locations of grounding features specified in "Field Quality Control" Article, including the following:
1. Test wells.
 2. Ground rods.
- B. Field quality-control reports.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
1. Burndy; Part of Hubbell Electrical Systems.
 2. ERICO International Corporation.
 3. Harger Lightning & Grounding.
 4. ILSCO.
 5. O-Z/Gedney; a brand of Emerson Industrial Automation.
 6. Thomas & Betts Corporation; A Member of the ABB Group.

7. Or Approved Equal.

2.2 SYSTEM DESCRIPTION

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with UL 467 for grounding and bonding materials and equipment.

2.3 CONDUCTORS

- A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.
- B. Bare Copper Conductors:
 - 1. Solid Conductors: ASTM B 3.
 - 2. Stranded Conductors: ASTM B 8.
 - 3. Tinned Conductors: ASTM B 33.
 - 4. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch (6 mm) in diameter.
 - 5. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
 - 6. Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.6 mm) thick.
 - 7. Tinned Bonding Jumper: Tinned-copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.6 mm) thick.

2.4 CONNECTORS

- A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.
- B. Bolted Connectors for Conductors and Pipes: Copper or copper alloy.
- C. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.
- D. Bus-Bar Connectors: Mechanical type, cast silicon bronze, solderless compression-type wire terminals, and long-barrel, two-bolt connection to ground bus bar.

2.5 GROUNDING ELECTRODES

- A. Ground Rods: Copper-clad steel; 3/4 inch by 10 feet.

PART 3 - EXECUTION

3.1 APPLICATIONS

- A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger unless otherwise indicated.
- B. Underground Grounding Conductors: Install bare tinned-copper conductor, No. 2/0 AWG minimum.
 - 1. Bury at least 24 inches (600 mm) below grade.
- C. Conductor Terminations and Connections:
 - 1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
 - 2. Underground Connections: Welded connectors except at test wells and as otherwise indicated.
 - 3. Connections to Ground Rods at Test Wells: Bolted connectors.
 - 4. Connections to Structural Steel: Welded connectors.

3.2 EQUIPMENT GROUNDING

- A. Install insulated equipment grounding conductors with all feeders and branch circuits.
- B. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:
 - 1. Feeders and branch circuits.
 - 2. Lighting circuits.
 - 3. Receptacle circuits.
 - 4. Single-phase motor and appliance branch circuits.
 - 5. Three-phase motor and appliance branch circuits.
 - 6. Flexible raceway runs.
- C. Poles Supporting Outdoor Lighting Fixtures or structures: Install grounding electrode and a separate insulated equipment grounding conductor in addition to grounding conductor installed with branch-circuit conductors.

3.3 INSTALLATION

- A. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

B. Ground Rods: Drive rods until tops are 2 inches (50 mm) below finished floor or final grade unless otherwise indicated.

1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating if any.

3.4 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.
3. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, and at individual ground rods. Make tests at ground rods before any conductors are connected.
 - a. Measure ground resistance no fewer than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
 - b. Perform tests by fall-of-potential method according to IEEE 81.

B. Grounding system will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

D. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Owner promptly and include recommendations to reduce ground resistance.

* * END OF SECTION **

**SECTION 26 05 29
HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:

1. Hangers and supports for electrical equipment and systems.
2. Construction requirements for concrete bases.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for the following:
 - a. Hangers.
 - b. Steel slotted support systems.
 - c. Clamps.
2. Include rated capacities and furnished specialties and accessories.

- B. Shop Drawings: Signed and sealed by a qualified professional engineer. For fabrication and installation details for electrical hangers and support systems.

1. Trapeze hangers. Include product data for components.
2. Steel slotted-channel systems.
3. Equipment supports.
4. Vibration Isolation Base Details: Detail fabrication, including anchorages and attachments to structure and to supported equipment. Include adjustable motor bases, rails, and frames for equipment mounting.

- C. Delegated-Design Submittal: For hangers and supports for electrical systems.

1. Include design calculations and details of trapeze hangers.

2. Include design calculations for seismic restraints.

1.4 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 40 00 "Quality Control," to design hanger and support system.
- B. Seismic Performance: Hangers and supports shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
 1. The term "withstand" means "the supported equipment and systems will remain in place without separation of any parts when subjected to the seismic."

2.2 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

- A. Steel Slotted Support Systems: Comply with MFMA-4 factory-fabricated components for field assembly.
 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Allied Tube & Conduit; a part of Atkore International.
 - b. ERICO International Corporation.
 - c. GS Metals Corp.
 - d. Thomas & Betts Corporation; A Member of the ABB Group.
 - e. Unistrut; Part of Atkore International.
 - f. Or Approved Equal.
 2. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
 3. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.
 4. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.

5. Channel Dimensions: Selected for applicable load criteria.
- B. Conduit and Cable Support Devices: Steel hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.
- C. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M steel plates, shapes, and bars; black and galvanized.
- D. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:
1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
 - a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - 1) Hilti, Inc.
 - 2) ITW Ramset/Red Head; Illinois Tool Works, Inc.
 - 3) MKT Fastening, LLC.
 - 4) Or Equal.
 2. Mechanical-Expansion Anchors: Insert-wedge-type, stainless steel, for use in hardened Portland cement concrete, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
 - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1) B-line, an Eaton business.
 - 2) Empire Tool and Manufacturing Co., Inc.
 - 3) Hilti, Inc.
 - 4) ITW Ramset/Red Head; Illinois Tool Works, Inc.
 - 5) Or Approved Equal.
 3. Concrete Inserts: Steel or malleable-iron, slotted support system units are similar to MSS Type 18 units and comply with MFMA-4 or MSS SP-58.
 4. Clamps for Attachment to Steel Structural Elements: MSS SP-58 units are suitable for attached structural element.
 5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.

6. Toggle Bolts: Stainless-steel springhead type.

7. Hanger Rods: Threaded steel.

2.3 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

A. Description: Welded or bolted structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.

PART 3 - EXECUTION

3.1 APPLICATION

A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems unless requirements in this Section are stricter.

B. Comply with requirements for raceways and boxes specified in Section 260533 "Raceways and Boxes for Electrical Systems."

C. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMTs, IMCs, and RMCs as required by NFPA 70. Minimum rod size shall be 1/4 inch (6 mm) in diameter.

D. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.

1. Secure raceways and cables to these supports with two-bolt conduit clamps.

3.2 SUPPORT INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this article.

B. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb (90 kg).

C. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:

1. To New Concrete: Bolt to concrete inserts.

2. To Existing Concrete: Expansion anchor fasteners.

3. Instead of expansion anchors, powder-actuated driven threaded studs provided with lock washers and nuts may be used in existing standard-weight concrete 4 inches (100 mm) thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches (100 mm) thick.

- D. Drill holes for expansion anchors in concrete at locations and to depths that avoid the need for reinforcing bars.

3.3 INSTALLATION OF FABRICATED METAL SUPPORTS

- A. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.
- B. Field Welding: Comply with AWS D1.1/D1.1M.

3.4 CONCRETE BASES

- A. Construct concrete bases of dimensions indicated but not less than 4 inches (100 mm) larger in both directions than supported unit, and so anchors will be a minimum of 10 bolt diameters from edge of the base.
- B. Use 3000-psi (20.7-MPa), 28-day compressive-strength concrete. Concrete materials, reinforcement, and placement requirements are specified in Section 03 30 00 "Cast-in-Place Concrete."
- C. Anchor equipment to concrete base as follows:
 - 1. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 2. Install anchor bolts to elevations required for proper attachment to supported equipment.
 - 3. Install anchor bolts according to anchor-bolt manufacturer's written instructions.

3.5 PAINTING

- A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
 - 1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils (0.05 mm).
- B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

** END OF SECTION **

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**SECTION 26 05 30
PROCESS INSTRUMENTATION AND CONTROL SYSTEM (PICS)**

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section of the specifications includes materials, testing, and installation of process instrumentation and control system as specified herein and indicated on the drawings.
- B. These specifications shall not be interpreted as permission or direction to violate any governing code or ordinance. Equipment, materials, and workmanship shall comply with the latest revisions of the following codes and standards:
 - 1. Instrumentation: Instrument Society of America (ISA).
 - 2. Wiring: California Electrical Code (CEC), ISA S5.3 and S5.4.
 - 3. Control Panels and Equipment: NEMA, UL, and ANSI.
 - 4. Control Logic: NFPA 79.
 - 5. Piping: ANSI B31.3 (instrumentation piping).

1.2 SCOPE OF WORK

- A. The work involves furnishing all hardware, installation, labor, material, equipment, and engineering in strict compliance with the contract documents for the Owner.
- B. The Contractor shall be responsible for programming the Programmable Logic Controller (PLC) and the Operator Interface Terminal (OIT).
- C. The Contractor shall configure the PLC for communication with the existing communication network of the current Waste Water Collection (WWC) remote monitoring system. Provide a LAN connection via a modem connected to a 900 MHz radio.
- D. Specific items include, but not limited to, the following:
 - 1. Field instruments.
 - 2. Control Panel.
- E. Submittal drawings shall show interface between PLC and OIT, field instruments & WWC Stations.

1.3 SUBMITTALS

- A. Detailed System Drawings and Data: The submittal shall consist of six sets of detailed drawings and data prepared and organized by the Contractor. All drawings, schematics, layouts, and diagrams shall be done on 11" x 17" sheets utilizing AutoCAD. Two sets of submittals will be returned to the Contractor.
1. Submittals shall be in three-ring hard-cover binders and arranged for convenient use including tab sheets, all indexed, and cross referenced with a separate index for each item.
 2. Provide manufacturers cut sheets and manuals for all hardware to be provided.
 3. Provide ISA type instrumentation data sheets for each component, together with a technical product brochure or bulletin. The data sheets, as a minimum, shall show:
 - a. Instrument tag designation.
 - b. Component name.
 - c. Manufacturer's model number.
 - d. Calibrated range.
 - e. Instrument location.
 - f. Input and output characteristics.
 - g. Scale range and units (if any) and multiplier (if any).
 - h. Requirements for electric supply.
 - i. Vendor/ distributor
 4. Group the data sheets together in the submittal by type. Provide individual data sheets for each instrument with one brochure or bulletin to cover all identical uses of that component.
 5. The detailed construction drawing submittal shall include, as a minimum, the following types of drawings and diagrams required for the construction of this project:
 - a. Legend, Symbols, and Index.
 - b. Power Distribution Diagrams.
 - c. Instrument Control Panel Layouts/Construction Drawings/Details.
 - d. Internal Panel Wiring Diagrams.

- e. Digital I/O Module Wiring Diagrams.
- f. Analog I/O Module Wiring Diagrams.
- g. Detailed Loop Interconnection Wiring Diagrams (per ISA S5.3 and S5.4) for the entire system showing all control equipment, instrumentation, electrical equipment, components, wiring, routing, J-boxes, terminations, wire tags, and wire colors. The diagrams shall show the detailed interconnection of all electrical equipment, instrumentation, panels, enclosures, components and the like provided under this contract.
- h. Detailed Ladder Diagrams in a format similar to NFPA 79 (for discrete wiring) to meet the following minimum requirements:
 - 1) Where the internal wiring diagrams of subassemblies are furnished on separate sheets, they shall be shown as a rectangle in the schematic diagram with all external points identified and cross-referenced to the separate sheets of the control circuit. Coils and contacts internal to the subassemblies shall be shown in the rectangle connected to their terminal points.
- i. A cross-referencing system shall be used in conjunction with each relay coil so that associated contacts may be readily located on the diagram. Where a relay contact appears on a sheet separate from the one on which the coil is shown, the purpose of the contact shall be described on the same sheet. Spare contacts shall be shown.
- j. Limit, pressure, float, flow, temperature sensitive, and similar switch symbols shall be shown on the schematic (ladder) diagram with all utilities turned off (electric power, air, gas, oil, water, lubrication, etc.) and with the equipment at its normal starting position. If the equipment is shown in a specific position, the position shall be identified.
- k. Contacts of multiple contact devices, e.g., selector switches, shall be shown on the line of the schematic diagram where they are connected in a circuit. A mechanical connection between the multiple contacts shall be indicated by a dotted line or arrow. This does not apply to control relays, starters, or contactors. Additional charts or diagrams may be used to indicate the position of multiple contact devices such as drum, cam, and selector switches.
- l. The purpose or function of all switches shall be shown adjacent to the symbols. The purpose or function of controls such as relays, starters, contactors, solenoids, subassemblies, and timers on the diagram shall be shown adjacent to their respective symbols. The number of positions of the solenoid valve shall be shown adjacent to the valve solenoid symbol.

- m. Arrangement and construction drawings for consoles, control panels, and for other special panels for field installation. These drawings shall include dimensions, location of all components, identification of all components, bill of materials, detailed schematics of all internal wiring, preparation and finish data, nameplates, and the like. These drawings also shall include enough other details to define the style and overall appearance of the assembly; include a finish sample for all panel surfaces.
 - n. Installation, mounting, and anchoring details for all field instruments and panel mounted components.
 - o. An instrument list including all instruments provided under this project
 - p. An I/O List for the PLC in the project.
- B. Complete detailed bills of material: Detailed bill of material for all components shall be provided including complete manufacturers name and model number, quantity to be provided, and cross references to data sheet sections.
- C. Screens: Submit colored screens per Owner's requirements and approval. Screens shall include as a minimum:
- 1. Main Menu screen showing directory of available Screens
 - 2. Process Screen showing arrangement of pumps, piping & instruments.
 - 3. Pump status showing the status of each pump – Off, Running, Alarm.
 - 4. Liquid level of wet well.
 - 5. Alarm screen showing time & date of each alarm.
 - 6. Historical data as required by Owner.
- D. Operation, Maintenance, and Repair Manuals:
- 1. The Operation and Maintenance (O&M) manuals shall be submitted and approved prior to the testing of the project systems. The O&M manuals shall be used to assist with commissioning and any red-lines made during testing shall be revised and resubmitted as the final set of six (6) O&M manuals.
 - 2. The organization of the initial submittal required above shall be compatible to eventual inclusion as one volume of the operation, maintenance, and repair manuals.
 - 3. Operation manuals shall be prepared and submitted to the Owner's Representative for preliminary review in six copies. When the Owner's Representative is satisfied that these are complete and properly prepared, six final sets shall be delivered to the Owner's Representative.

4. The complete operation manual shall contain all the information included in the preliminary equipment submittal, the detailed installation submittal, and the additional information required herein, all bound in hard-cover binders and arranged for convenient use including tab sheets, all indexed and cross referenced with a separate index for each item, and all final as-built drawings with the AutoCAD electronic files.
5. The operation manuals shall contain: (1) calibration and maintenance instructions, (2) trouble-shooting instructions, and (3) instructions for ordering replacement parts.

1.4 QUALIFICATIONS AND RESPONSIBILITY OF CONTRACTOR

- A. The Contractor shall furnish and install all proposed hardware as shown on the drawings and as specified herein. The PLC system installation and wiring connections to peripheral equipment and instruments shall be the responsibility of the system supplier using qualified personnel possessing the necessary equipment and having experience in making similar installations. Evidence of such qualification, as well as notification of the system supplier assuming unit responsibility, shall be furnished to the Owner in writing prior to commencement of the work. The qualification evidence shall include the following:
 1. The system supplier shall have had multiple project experience with the installation of industrial control systems similar in type to those to be installed in this project.
 2. A list of completed similar installations including name and address of owner, name of project, and date of completion.
 3. The name and qualifications of supervisory personnel to be directly responsible for the installation of the control system.
- B. Under this section, the Contractor shall furnish the following:
 1. Special tools and test equipment required by the supplier.
 2. Control Panel
 3. Installation, integration and testing.
 4. Documentation.
 5. Warranty (one year).
 6. Shipping and receiving.
- C. All calibration and final checkout of the process instrumentation and control system shall be witnessed by the Owner's Representative to determine if the system complies with the contract documents.

- D. The Contractor shall be responsible for coordinating and interfacing with equipment supplied under these contract documents which are an integral part of the system. Interfacing shall be incorporated in the detailed systems drawings and data section of the contract documents.
- E. The system supplier shall be experienced in the design, programming, and service of this type of equipment. In the event of a dispute as to the acceptability of the system supplier, the Owner's Representative shall make the final determination.

1.5 GUARANTEE

- A. The Contractor shall repair or replace defective components, rectify malfunctions, correct faulty workmanship, all at no additional cost to the Owner during the guarantee.
- B. To fulfill this obligation, he shall utilize technical service personnel designated by the Contractor who was originally assigned project responsibility. Services shall be performed within five calendar days after notification by the Owner's Representative.

PART 2 - MATERIALS

2.1 DESIGNATIONS OF COMPONENTS

- A. In these specifications and on the plans, all systems, and other elements are represented schematically and are designated by numbers, as derived from criteria in Instrument Society of America Standards. The nomenclature and numbers designated herein and on the plans shall be employed exclusively throughout shop drawings, data sheets, and the like. Any other symbols, designations, and nomenclature unique to a manufacturer's standard methods shall not replace those prescribed above, as used herein, and on the plans.

2.2 INSTRUMENT TAGGING

- A. Attach a stainless-steel tag to the instrument at the factory. Permanently mark the stainless-steel tag with the instrument tag number. The manufacturer's standard metal nameplate as a minimum shall denote model number, serial number, operating electrical voltage and amperage (when applicable), and date of manufacture.

2.3 INSTRUMENT SYSTEM POWER

- A. Power provided for the instrument system at the facility shall be 120-volt a-c, single phase, 60 Hz.
- B. Where d-c power supplies are not furnished integral with any one instrument system loop, then provide separate solid-state power supplies.

2.4 FLOAT SWITCH

- A. Mechanical switch in a polypropylene housing complete with a suspension cable (length to suit) sheathed with a special PVC compound. Xylem ENM-10 or approved equal.

2.5 MATCHING STYLE, APPEARANCE, AND TYPE

- A. All display instruments of each type shall represent the same outward appearance, having the same physical size and shape and the same size and style of numbers and pointers.

PART 3 - EXECUTION

3.1 UNIFORMITY OF COMPONENTS

- A. Components which perform the same or similar functions shall, to the greatest degree possible, be of the same or similar type, the same manufacture, the same grade of construction, the same size, and the same appearance.

3.2 MOUNTING OF EQUIPMENT AND ACCESSORIES

- A. Mount equipment in accordance with the installation detail drawings as prepared by the Contractor and reviewed by the Engineer. Mount equipment so that they are rigidly supported, level and plumb, and in such a manner as to provide accessibility; protection from damage; isolation from heat, shock, and vibration; and freedom from interference with other equipment, piping, and electrical work. Do not install consoles, cabinets, and panels until heavy construction work adjacent to computer and telemetry equipment has been completed to the extent that there shall be no damage to the equipment.
- B. Locate devices, including accessories, where they shall be accessible from grade, except as shown otherwise.
- C. Mount local equipment in cabinets or existing panels as specified. Mount associated I/O terminals on a common panel or rack; mounting panels and rack shall be baked enamel.
- D. Coordinate the installation of the electrical service to components related to the system to assure a compatible and functionally correct system. All accessories shall be coordinated and installation supervised by the Contractor.

3.3 CALIBRATION

- A. Each instrument requiring factory calibration shall be furnished with calibration data. The calibration data shall be factory certified.

- B. Calibrate systems after installation in conformance with the component manufacturer's instructions. This shall provide that those components having adjustable features are set carefully for the specific conditions and applications of this installation and that the components and/or systems are within the specified limits of accuracy. Defective elements which cannot achieve proper calibration or accuracy, either individually or within a system, shall be replaced. Accomplish this calibration work by a technical field representative of the single instrument supplier. He shall certify in writing to the Engineer that all calibrations have been made and that all systems are ready to operate.

3.4 DEMONSTRATION & TRAINING

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel on programming the Programmable Logic Controller (PLC) and modifying the display monitor screens.
 - 1. Train Owner's maintenance personnel on programming the PLC for adding or editing ladder diagrams and annotation.
 - 2. Train Owner's maintenance personnel on protocols for interfacing with radio communication to existing SCADA system.
 - 3. Train Owner's maintenance personnel on adding or editing the various display screens of the Operator Interface Terminal (OIT).
 - 4. Train Owner's maintenance personnel on troubleshooting both the PLC system and OIT.

**** END OF SECTION ****

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**SECTION 26 05 33
RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:

1. Metal conduits, tubing, and fittings.
2. Nonmetal conduits, tubing, and fittings.
3. Boxes, enclosures, and cabinets.

- B. Related Requirements:

1. Section 26 05 43 "Underground Ducts and Raceways for Electrical Systems" for exterior ductbanks, manholes, and underground utility construction.

1.3 DEFINITIONS

- A. GRC: Galvanized rigid steel conduit.
- B. IMC: Intermediate metal conduit.
- C. EMT: Electrical Metal Tubing

1.4 ACTION SUBMITTALS

- A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.
- B. Shop Drawings: For custom enclosures and cabinets. Include plans, elevations, sections, and attachment details.

PART 2 - PRODUCTS

2.1 METAL CONDUITS, TUBING, AND FITTINGS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. AFC Cable Systems; a part of Atkore International.
 2. Allied Tube & Conduit; a part of Atkore International.
 3. Electri-Flex Company.
 4. O-Z/Gedney; a brand of Emerson Industrial Automation.
 5. Western Tube and Conduit Corporation.
 6. Or Equal.
- B. Listing and Labeling: Metal conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. GRC: Comply with ANSI C80.1 and UL 6.
- D. PVC-Coated Steel Conduit: PVC-coated rigid steel conduit.
1. Comply with NEMA RN 1.
 2. Coating Thickness: 0.040 inch (1 mm), minimum.
- E. LFMC: Flexible steel conduit with PVC jacket and complying with UL 360.
- F. Fittings for Metal Conduit: Comply with NEMA FB 1 and UL 514B.
1. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 886 and NFPA 70.
 2. Expansion Fittings: PVC or steel to match conduit type, complying with UL 651, rated for environmental conditions where installed, and including flexible external bonding jumper.
 3. Coating for Fittings for PVC-Coated Conduit: Minimum thickness of 0.040 inch (1 mm), with overlapping sleeves protecting threaded joints.
- G. Joint Compound for GRC: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

2.2 NONMETALLIC CONDUITS, TUBING, AND FITTINGS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
1. AFC Cable Systems; a part of Atkore International.
 2. Anamet Electrical, Inc.

3. Arnco Corporation.
 4. Condux International, Inc.
 5. RACO; Hubbell.
 6. Or Equal.
- B. Listing and Labeling: Nonmetallic conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. RNC: Type EPC-40-PVC, complying with NEMA TC 2 and UL 651 unless otherwise indicated.
- D. Fittings for ENT and RNC: Comply with NEMA TC 3; match to conduit or tubing type and material.
- E. Solvents and Adhesives: As recommended by conduit manufacturer.

2.3 BOXES, ENCLOSURES, AND CABINETS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
1. Crouse-Hinds, an Eaton business.
 2. EGS/Appleton Electric.
 3. Erickson Electrical Equipment Company.
 4. Hoffman; a brand of Pentair Equipment Protection.
 5. Hubbell Incorporated.
 6. RACO; Hubbell.
 7. Thomas & Betts Corporation; A Member of the ABB Group.
 8. Or Equal.
- B. General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets installed in wet locations shall be listed for use in wet locations.
- C. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.
- D. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, ferrous alloy, Type FD, with gasketed cover.
- E. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

- F. Cast-Metal Access, Pull, and Junction Boxes: Comply with NEMA FB 1 and UL 1773, galvanized, cast iron with gasketed cover.

2.4 HAZARDOUS LOCATIONS

- A. Electrical materials, equipment, and devices for installation in hazardous locations, as defined by NFPA 70: specifically approved by Underwriters' Laboratories, Inc., or Factory Mutual for particular "Class," "Division," and "Group" of hazardous locations involved. Boundaries and classifications of hazardous locations: as indicated. Equipment in hazardous locations: comply with UL 1203 for electrical equipment and industrial controls and UL 674 for motors.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

- A. Outdoors: Apply raceway products as specified below unless otherwise indicated:
1. Exposed Conduit: GRC.
 2. Concealed Conduit, Aboveground: GRC.
 3. Underground Conduit: RNC, Type EPC-40-PVC.
 4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
 5. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R.
- B. Indoors: Apply raceway products as specified below unless otherwise indicated:
1. Exposed, Not Subject to Physical Damage: GRC.
 2. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
 3. Damp or Wet Locations: GRC.
 4. Boxes and Enclosures: Explosion proof.
- C. Minimum Raceway Size: 3/4-inch trade size.
- D. Raceway Fittings: Compatible with raceways and suitable for use and location.
1. Rigid Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
 2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with this type of conduit. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by

fitting manufacturer and apply in thickness and number of coats recommended by manufacturer.

3. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.

E. Do not install aluminum conduits, boxes, or fittings in contact with concrete or earth.

3.2 INSTALLATION

- A. Hazardous Locations: Perform work in hazardous locations, as defined by NFPA 70, in strict accordance with NFPA 70 for particular "Class," "Division," and "Group" of hazardous locations involved. Provide conduit and cable seals where required by NFPA 70. Provide conduit with tapered threads.
- B. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NECA 102 for aluminum conduits. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.
- C. Keep raceways at least 6 inches (150 mm) away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.
- D. Complete raceway installation before starting conductor installation.
- E. Comply with requirements in Section 26 05 29 "Hangers and Supports for Electrical Systems" for hangers and supports.
- F. Arrange stub-ups so curved portions of bends are not visible above finished slab.
- G. Install no more than the equivalent of three 90-degree bends in any conduit run except for control wiring conduits, for which fewer bends are allowed. Support within 12 inches (300 mm) of changes in direction.
- H. Support conduit within 12 inches of enclosures to which attached.
- I. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.
- J. Coat field-cut threads on PVC-coated raceway with a corrosion-preventing conductive compound prior to assembly.
- K. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors including conductors smaller than No. 4 AWG.
- L. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to 1-1/4-inch (35mm) trade size and insulated throat metal bushings on 1-1/2-inch (41-mm) trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.

- M. Install raceways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus 1/4 turn more.
- N. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to assure a continuous ground path.
- O. Cut conduit perpendicular to the length. For conduits 2-inch (53-mm) trade size and larger, use roll cutter or a guide to make cut straight and perpendicular to the length.
- P. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb (90-kg) tensile strength. Leave at least 12 inches (300 mm) of slack at each end of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.
- Q. Install raceway sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings according to NFPA 70.
- R. Install devices to seal raceway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all raceways at the following points:
 - 1. Where an underground service raceway enters a building or structure.
 - 2. Where otherwise required by NFPA 70.
- S. Comply with manufacturer's written instructions for solvent welding RNC and fittings.
- T. Flexible Conduit Connections: Comply with NEMA RV 3. Use a maximum of 72 inches (1830 mm) of flexible conduit for equipment subject to vibration, noise transmission, or movement; and for transformers and motors.
 - 1. Use LFMC in damp or wet locations subject to severe physical damage.
- U. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to center of box unless otherwise indicated.
- V. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.
- W. Locate boxes so that cover or plate will not span different building finishes.
- X. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.
- Y. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.

3.3 PROTECTION

A. Protect coatings, finishes, and cabinets from damage and deterioration.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

**** END OF SECTION ****

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SECTION 26 05 43
UNDERGROUND DUCTS AND RACEWAYS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:

1. Direct-buried conduit, ducts, and duct accessories.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1. Include duct-bank materials, including separators and miscellaneous components.
2. Include ducts and conduits and their accessories, including elbows, end bells, bends, fittings, and solvent cement.

1.4 INFORMATIONAL SUBMITTALS

- A. Source quality-control reports.
- B. Field quality-control reports.

1.5 FIELD CONDITIONS

- A. Interruption of Existing Electrical Service: Do not interrupt electrical service to facilities occupied by Owner or others unless permitted under the following conditions, and then only after arranging to provide temporary electrical service according to requirements indicated:

1. Notify Owner no fewer than 14 days in advance of proposed interruption of electrical service.
2. Do not proceed with interruption of electrical service without Owner's written permission.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR DUCTS AND RACEWAYS

- A. Comply with ANSI C2.

2.2 CONDUIT

- A. RNC: NEMA TC 2, Type EPC-40-PVC, UL 651, with matching fittings by same manufacturer as the conduit, complying with NEMA TC 3 and UL 514B.
- B. PVC-Coated Steel Conduit: PVC-coated rigid steel conduit.
 - 1. Comply with NEMA RN 1.
 - 2. Coating Thickness: 0.040 inch (1 mm), minimum.

2.3 NONMETALLIC DUCTS AND DUCT ACCESSORIES

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - 1. ARNCO Corp.
 - 2. CANTEX INC.
 - 3. Condux International, Inc.
 - 4. Electri-Flex Company.
 - 5. Or Equal.
- B. Solvents and Adhesives: As recommended by conduit manufacturer.
- C. Duct Accessories:
 - 1. Warning Tape: Underground-line warning tape specified in Section 260553 "Identification for Electrical Systems."

PART 3 - EXECUTION

3.1 PREPARATION

- A. Coordinate layout and installation of ducts, manholes, handholes, and boxes with final arrangement of other utilities, site grading, and surface features as determined in the field. Notify Architect if there is a conflict between areas of excavation and existing structures or archaeological sites to remain.
- B. Coordinate elevations of ducts and duct-bank entrances into manholes, handholes, and boxes with final locations and profiles of ducts and duct banks, as determined by

coordination with other utilities, underground obstructions, and surface features. Revise locations and elevations as required to suit field conditions and to ensure that duct runs drain to manholes and handholes, and as approved by Architect.

3.2 UNDERGROUND DUCT APPLICATION

- A. Ducts for Electrical Feeders 600 V and Less: RNC, NEMA Type EPC-40-PVC, in direct-buried duct bank unless otherwise indicated.

3.3 EARTHWORK

- A. Excavation and Backfill: Comply with Section 31 23 33 "Trenching and Backfilling," but do not use heavy-duty, hydraulic-operated, compaction equipment.
- B. Restore surface features at areas disturbed by excavation, and re-establish original grades unless otherwise indicated. Replace removed sod immediately after backfilling is completed.
- C. Cut and patch existing pavement in the path of underground ducts and utility structures according to the contract documents.

3.4 DUCT INSTALLATION

- A. Install ducts according to NEMA TCB 2.
- B. Slope: Pitch ducts a minimum slope of 1:300 down toward manholes and handholes and away from buildings and equipment. Slope ducts from a high point in runs between two manholes, to drain in both directions.
- C. Curves and Bends: Use 5-degree angle couplings for small changes in direction. Use manufactured long sweep bends with a minimum radius of 48 inches (1200 mm), both horizontally and vertically, at other locations unless otherwise indicated.
- D. Joints: Use solvent-cemented joints in ducts and fittings and make watertight according to manufacturer's written instructions. Stagger couplings so those of adjacent ducts do not lie in same plane.
- E. Wall Penetrations: Make a transition from underground duct to rigid steel conduit at least 10 feet (3 m) outside the building wall, without reducing duct line slope away from the building, and without forming a trap in the line. Use fittings manufactured for duct-to-conduit transition.
- F. Sealing: Provide temporary closure at terminations of ducts that have cables pulled. Seal spare ducts at terminations. Use sealing compound and plugs to withstand at least 15-psig (1.03-MPa) hydrostatic pressure.
- G. Pulling Cord: Install 100-lbf- (445-N-) test nylon cord in empty ducts.
- H. Direct-Buried Duct Banks:

1. Excavate trench bottom to provide firm and uniform support for duct bank. Comply with requirements in Section 312000 "Earth Moving" for preparation of trench bottoms for pipes less than 6 inches (150 mm) in nominal diameter.
2. Support ducts on duct separators coordinated with duct size, duct spacing, and outdoor temperature.
3. Depth: Install top of duct bank at least 36 inches (900 mm) below finished grade unless otherwise indicated.
4. Install ducts with a minimum of 3 inches (75 mm) between ducts for like services and 6 inches (150 mm) between power and signal ducts.
5. Elbows: Install manufactured duct elbows for stub-ups at poles and equipment, at building entrances through floor, and at changes of direction in duct run unless otherwise indicated. Encase elbows for stub-up ducts throughout length of elbow.
6. Install manufactured PVC jacketed rigid steel conduit elbows for stub-ups at poles and equipment, at building entrances through floor, and at changes of direction in duct run.
 - a. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches (75 mm) of concrete.
 - b. For equipment mounted on outdoor concrete bases, extend steel conduit horizontally a minimum of 60 inches (1500 mm) from edge of equipment pad or foundation. Install insulated grounding bushings on terminations at equipment.
7. After installing first tier of ducts, backfill and compact. Start at tie-in point and work toward end of duct run, leaving ducts at end of run free to move with expansion and contraction as temperature changes during this process. Repeat procedure after placing each tier. After placing last tier, hand place backfill to 4 inches (100 mm) over ducts and hand tamp. Firmly tamp backfill around ducts to provide maximum supporting strength. Use hand tamper only. After placing controlled backfill over final tier, make final duct connections at end of run and complete backfilling with normal compaction. Comply with requirements in Section 31 23 33 "Trenching and Backfilling" for installation of backfill materials.
 - a. Place minimum 3 inches (75 mm) of sand as a bed for duct bank. Place sand to a minimum of 6 inches (150 mm) above top level of duct bank.
- I. Warning Tape: Bury warning tape approximately 12 inches (300 mm) above all concrete-encased ducts and duct banks. Align tape parallel to and within 3 inches (75 mm) of centerline of duct bank. Provide an additional warning tape for each 12-inch (300-mm) increment of duct-bank width over a nominal 18 inches (450 mm). Space additional tapes 12 inches (300 mm) apart, horizontally.

3.5 GROUNDING

- A. Ground underground ducts and utility structures according to Section 26 05 26 "Grounding and Bonding for Electrical Systems."

3.6 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections and prepare test reports:
 - 1. Demonstrate capability and compliance with requirements on completion of installation of underground ducts and utility structures.
 - 2. Pull solid aluminum or wood test mandrel through duct to prove joint integrity and adequate bend radii, and test for out-of-round duct. Provide a minimum 6-inch- (150-mm-) long mandrel equal to 80 percent fill of duct. If obstructions are indicated, remove obstructions and retest.
- B. Correct deficiencies and retest as specified above to demonstrate compliance.

3.7 CLEANING

- A. Pull leather-washer-type duct cleaner, with graduated washer sizes, through full length of ducts. Follow with rubber duct swab for final cleaning and to assist in spreading lubricant throughout ducts.
- B. Clean internal surfaces of manholes, including sump. Remove foreign material.

**** END OF SECTION ****

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SECTION 26 05 44
SLEEVES AND SLEEVE SEALS FOR ELECTRICAL RACEWAYS AND CABLING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:

1. Sleeves for raceway and cable penetration of non-fire-rated construction walls and floors.
2. Sleeve-seal systems.
3. Sleeve-seal fittings.
4. Grout.
5. Silicone sealants.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 SLEEVES

- A. Wall Sleeves:

1. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, plain ends.
2. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.

- B. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies: Galvanized-steel sheet; 0.0239-inch (0.6-mm) minimum thickness; round tube closed with welded longitudinal joint, with tabs for screw-fastening the sleeve to the board.

- C. PVC-Pipe Sleeves: ASTM D 1785, Schedule 40.

- D. Molded-PVC Sleeves: With nailing flange for attaching to wooden forms.

E. Molded-PE or -PP Sleeves: Removable, tapered-cup shaped, and smooth outer surface with nailing flange for attaching to wooden forms.

F. Sleeves for Rectangular Openings:

1. Material: Galvanized sheet steel.

2. Minimum Metal Thickness:

a. For sleeve cross-section rectangle perimeter less than 50 inches (1270 mm) and with no side larger than 16 inches (400 mm), thickness shall be 0.052 inch (1.3 mm).

b. For sleeve cross-section rectangle perimeter 50 inches (1270 mm) or more and one or more sides larger than 16 inches (400 mm), thickness shall be 0.138 inch (3.5 mm).

2.2 SLEEVE-SEAL SYSTEMS

A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable.

1. Sealing Elements: EPDM rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.

2. Pressure Plates: Stainless steel.

3. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements.

2.3 SLEEVE-SEAL FITTINGS

A. Description: Manufactured plastic, sleeve-type, waterstop assembly made for embedding in concrete slab or wall. Unit shall have plastic or rubber waterstop collar with center opening to match piping OD.

2.4 GROUT

A. Description: Nonshrink; recommended for interior and exterior sealing openings in non-fire-rated walls or floors.

B. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

C. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

2.5 SILICONE SEALANTS

A. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below.

1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces that are not fire rated.
- B. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.

PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION FOR NON-FIRE-RATED ELECTRICAL PENETRATIONS

- A. Comply with NECA 1.
- B. Comply with NEMA VE 2 for cable tray and cable penetrations.
- C. Sleeves for Conduits Penetrating Above-Grade Non-Fire-Rated Concrete and Masonry-Unit Floors and Walls:
 1. Interior Penetrations of Non-Fire-Rated Walls and Floors:
 - a. Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint.
 - b. Seal space outside of sleeves with mortar or grout. Pack sealing material solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect material while curing.
 2. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
 3. Size pipe sleeves to provide 1/4-inch (6.4-mm) annular clear space between sleeve and raceway or cable unless sleeve seal is to be installed.
 4. Install sleeves for wall penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of walls. Cut sleeves to length for mounting flush with both surfaces of walls. Deburr after cutting.
 5. Install sleeves for floor penetrations. Extend sleeves installed in floors 2 inches (50 mm) above finished floor level. Install sleeves during erection of floors.
- D. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies:
 1. Use circular metal sleeves unless penetration arrangement requires rectangular sleeved opening.
 2. Seal space outside of sleeves with approved joint compound for gypsum board assemblies.
- E. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.

- F. Aboveground, Exterior-Wall Penetrations: Seal penetrations using **steel** pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch (25-mm) annular clear space between pipe and sleeve for installing mechanical sleeve seals.
- G. Underground, Exterior-Wall and Floor Penetrations: Install cast-iron pipe sleeves. Size sleeves to allow for 1-inch (25-mm) annular clear space between raceway or cable and sleeve for installing sleeve-seal system.

3.2 SLEEVE-SEAL-SYSTEM INSTALLATION

- A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at raceway entries into building.
- B. Install type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.3 SLEEVE-SEAL-FITTING INSTALLATION

- A. Install sleeve-seal fittings in new walls and slabs as they are constructed.
- B. Assemble fitting components of length to be flush with both surfaces of concrete slabs and walls. Position waterstop flange to be centered in concrete slab or wall.
- C. Secure nailing flanges to concrete forms.
- D. Using grout, seal the space around outside of sleeve-seal fittings.

**** END OF SECTION ****

**SECTION 26 05 53
IDENTIFICATION FOR ELECTRICAL SYSTEMS**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:

1. Identification of power and control cables.
2. Identification for conductors.
3. Underground-line warning tape.
4. Warning labels and signs.
5. Instruction signs.
6. Equipment identification labels, including arc-flash warning labels.
7. Miscellaneous identification products.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for electrical identification products.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Comply with ASME A13.1.
- B. Comply with NFPA 70.
- C. Comply with ANSI Z535.4 for safety signs and labels.
- D. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

2.2 TAPES AND STENCILS:

- A. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.
- B. Self-Adhesive Vinyl Tape: Colored, heavy duty, waterproof, fade resistant; not less than 3 mils (0.08 mm) thick by 1 to 2 inches (25 to 50 mm) wide; compounded for outdoor use.
- C. Underground-Line Warning Tape
 - 1. Tape:
 - a. Recommended by manufacturer for the method of installation and suitable to identify and locate underground electrical and communications utility lines.
 - b. Printing on tape shall be permanent and shall not be damaged by burial operations.
 - c. Tape material and ink shall be chemically inert and not subject to degradation when exposed to acids, alkalis, and other destructive substances commonly found in soils.
 - 2. Color and Printing:
 - a. Comply with ANSI Z535.1, ANSI Z535.2, ANSI Z535.3, ANSI Z535.4, and ANSI Z535.5.
 - b. Inscriptions for Red-Colored Tapes: "ELECTRIC LINE, HIGH VOLTAGE".
 - c. Inscriptions for Orange-Colored Tapes: "TELEPHONE CABLE, CATV CABLE, COMMUNICATIONS CABLE, OPTICAL FIBER CABLE".

2.3 SIGNS

- A. Baked-Enamel Signs:
 - 1. Preprinted aluminum signs, punched or drilled for fasteners, with colors, legend, and size required for application.
 - 2. 1/4-inch (6.4-mm) grommets in corners for mounting.
 - 3. Nominal Size: 7 by 10 inches (180 by 250 mm).

2.4 MISCELLANEOUS IDENTIFICATION PRODUCTS

- A. Engraved, Laminated Acrylic or Melamine Label: Black letters on a white background. Minimum letter height shall be 3/8 inch (10 mm). Drilled for fasteners.

- B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Self-Adhesive Identification Products: Before applying electrical identification products, clean substrates of substances that could impair bond, using materials and methods recommended by manufacturer of identification product.

3.2 INSTALLATION

- A. Verify and coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and operation and maintenance manual. Use consistent designations throughout Project.
- B. Verify identity of each item before installing identification products.
- C. Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment. Install access doors or panels to provide view of identifying devices.
- D. Apply identification devices to surfaces that require finish after completing finish work.
- E. Attach signs and plastic labels that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.
- F. Attach plastic raceway and cable labels that are not self-adhesive type with clear vinyl tape, with adhesive appropriate to the location and substrate.
- G. During backfilling of trenches, install continuous underground-line warning tape directly above cable or raceway at 6 to 8 inches (150 to 200 mm) below finished grade. Use multiple tapes where width of multiple lines installed in a common trench exceeds 16 inches (400 mm) overall.

3.3 IDENTIFICATION SCHEDULE

- A. Power-Circuit Conductor Identification, 600 V or Less: For conductors in vaults, pull and junction boxes, manholes, and handholes, use color-coding conductor tape to identify the phase.
 - 1. Color-Coding for Phase- and Voltage-Level Identification, 600 V or Less: Use colors listed below for ungrounded feeder and branch-circuit conductors.
 - a. Color shall be factory applied or field applied for sizes larger than No. 8 AWG if authorities having jurisdiction permit.
 - b. Colors for 208/120-V Circuits:

- 1) Phase A: Black.
 - 2) Phase B: Red.
 - 3) Phase C: Blue.
- c. Colors for 480/277-V Circuits:
- 1) Phase A: Brown.
 - 2) Phase B: Orange.
 - 3) Phase C: Yellow.
- d. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches (150 mm) from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Locate bands to avoid obscuring factory cable markings.
- B. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Baked-enamel warning signs.
1. Comply with 29 CFR 1910.145.
 2. Identify system voltage with black letters on an orange background.
 3. Apply to exterior of door, cover, or other access.
- C. Arc Flash Warning Labeling: Self-adhesive thermal transfer vinyl labels.
1. Comply with NFPA 70E and ANSI Z535.4.
- D. Operating Instruction Signs: Install instruction signs to facilitate proper operation and maintenance of electrical systems and items to which they connect. Install instruction signs with approved legend where instructions are needed for system or equipment operation.
- E. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and operation and maintenance manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm unless equipment is provided with its own identification.
1. Labeling Instructions:
 - a. Indoor Equipment: Self-adhesive, engraved, laminated acrylic or melamine plastic label. Unless otherwise indicated, provide a single line of text with 1/2-inch- (13-mm-) high letters on 1-1/2-inch- (38-mm-) high label; where two lines of text are required, use labels 2 inches (50 mm) high.

- b. Outdoor Equipment: Engraved, laminated acrylic or melamine label.
- c. Elevated Components: Increase sizes of labels and letters to those appropriate for viewing from the floor.
- d. Unless labels are provided with self-adhesive means of attachment, fasten them with appropriate mechanical fasteners that do not change the NEMA or NRTL rating of the enclosure.

2. Equipment To Be Labeled:

- a. Panelboards: Typewritten directory of circuits in the location provided by panelboard manufacturer.
- b. Enclosures and electrical cabinets.
- c. Access doors and panels for concealed electrical items.
- d. Motor-control centers.
- e. Enclosed switches.
- f. Enclosed circuit breakers.
- g. Enclosed controllers.
- h. Push-button stations.

** END OF SECTION **

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26 05 63
UNINTERRUPTIBLE POWER SUPPLY

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section includes materials and installation of a complete uninterruptible power supply system for critical loads including but not limited to programmable logic controllers, instrumentation and telemetry systems.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Process Instrumentation and Control System: 26 05 30

1.3 SUBMITTALS

- A. Submit ratings and characteristics including voltage, connection, enclosure type and dimensions, and conduit entry restrictions.

PART 2 - MATERIALS

2.1 GENERAL REQUIREMENTS

- A. The UPS system shall be designed to protect the PLC, instruments, and telemetry system from line disturbance, subcycle power losses, and power outages. In normal operation the UPS shall supply filtered and regulated ac power to the load. Upon failure of the commercial ac power, the critical load shall continue to be supplied by the inverter, which shall obtain its power from the battery.
- B. The interruption to the critical load upon failure or restoration of the commercial ac source shall not exceed 4 milliseconds. Upon restoration of the commercial source, the inverter/charger shall recharge the battery.
- C. An external manually operated switch shall be provided to transfer the load to the bypass line with a safety interlock to prevent the load from being transferred back during servicing.

2.2 UNINTERRUPTIBLE POWER SUPPLY UNIT

- A. The UPS shall be complete with power indication, common alarm dry contact and running status dry contacts from relay output cards, and inverter circuit breaker protection.
- B. External batteries shall be sealed leak proof and maintenance free, and mounted adjacent to the UPS main unit.

- C. The UPS unit shall be mounted in a freestanding cabinet provided by the manufacturer or in PLC cabinet as shown on drawings.
- D. The UPS system shall meet the following requirements:
 - 1. Input/output voltage: 120 volts ac, single phase, 60 Hz.
 - 2. Minimum output rating:
 - a. Pump station panel: 1500 VA
 - b. Provide higher rating as required based on specified equipment and minimum operating time requirement (see below for time requirement).
 - 3. Output Harmonic Distortion: 5 percent maximum at full load.
 - 4. Frequency stability: +/- 0.5 percent.
 - 5. Voltage regulation for line and load: +/-2 percent.
 - 6. Overload capacity: 125 percent for 3 seconds.
 - 7. Full recharge time: 48 hours.
 - 8. Battery lifetime: 3 years at ambient temperature 45 C.
 - 9. Isolation/maintenance bypass switch.
 - 10. A relay output card to enable monitoring via dry contacts the RUN and FAIL status of the unit
 - 11. The UPS system shall be capable of delivering power to the connected load for the minimum time duration of 4 hours for pump station.
 - 12. The UPS system shall be APC Cat. BR1500G or as approved.

PART 3 - PART 3 – EXECUTION

3.1 GENERAL

- A. Install the UPS system in the designated location according to manufacturer's instructions.

3.2 UPS STATUS MONITORING

- B. UPS Alarm: This contact shall be closed when the UPS is normal and open when the UPS is in an alarm state.

3.3 TERMINAL BLOCKS

- C. Wiring for external circuits, including the alarm contact, shall be brought to grouped terminal blocks located for convenient connection. Provisions shall include suitable marked terminal blocks for connection of 12 AWG copper wire. Terminal designations shall agree with the manufacturer's wiring diagram.

3.4 FUNCTIONAL TESTS

- D. Upon installation of the UPS system, the supplier shall conduct on-site functional testing which shall include a minimum of 10 transfer-retransfer cycles. The UPS supplier shall inform the Owner and Engineer of the onsite test schedule so that the test may be witnessed by the Owner and Engineer.

**** END OF SECTION ****

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**SECTION 26 24 19
MOTOR-CONTROL CENTERS**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes MCCs for use with ac circuits rated 600 V and less and having the following factory-installed components:
1. Incoming main lugs and OCPDs.
 2. Full-voltage magnetic controllers.
 3. Reduced-voltage, solid-state controllers.
 4. Variable frequency controller
 5. Feeder-tap units.
 6. TVSS.
 7. Instrumentation.
 8. Auxiliary devices.

1.3 DEFINITIONS

- A. CE: Conformance Europeene (European Compliance).
- B. CPT: Control power transformer.
- C. DDC: Direct digital control.
- D. EMI: Electromagnetic interference.
- E. GFCI: Ground fault circuit interrupting.
- F. IGBT: Insulated-gate bipolar transistor.
- G. LAN: Local area network.
- H. LED: Light-emitting diode.
- I. MCC: Motor-control center.

- J. MCCB: Molded-case circuit breaker.
- K. MCP: Motor-circuit protector.
- L. NC: Normally closed.
- M. NO: Normally open.
- N. OCPD: Overcurrent protective device.
- O. PCC: Point of common coupling.
- P. PID: Control action, proportional plus integral plus derivative.
- Q. PT: Potential transformer.
- R. PWM: Pulse-width modulated.
- S. RFI: Radio-frequency interference.
- T. SCR: Silicon-controlled rectifier.
- U. TDD: Total demand (harmonic current) distortion.
- V. THD(V): Total harmonic voltage demand.
- W. TVSS: Transient voltage surge suppressor.
- X. VFC: Variable-frequency controller.

1.4 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: MCCs shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
 1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of controller and each type of MCC. Include shipping and operating weights, features, performance, electrical ratings, operating characteristics, and furnished specialties and accessories.
- B. Shop Drawings: For each MCC, manufacturer's approval drawings as defined in UL 845. In addition to requirements specified in UL 845, include dimensioned plans, elevations, and sections; and conduit entry locations and sizes, mounting arrangements, and details, including required clearances and service space around equipment.

1. Show tabulations of installed devices, equipment features, and ratings. Include the following:
 - a. Each installed unit's type and details.
 - b. Factory-installed devices.
 - c. Enclosure types and details.
 - d. Nameplate legends.
 - e. Short-circuit current (withstand) rating of complete MCC, and for bus structure and each unit.
 - f. Features, characteristics, ratings, and factory settings of each installed controller and feeder device, and installed devices.
 - g. Specified optional features and accessories.
2. Schematic Wiring Diagrams: For power, signal, and control wiring for each installed controller.
3. Nameplate legends.
4. Vertical and horizontal bus capacities.
5. Features, characteristics, ratings, and factory settings of each installed unit.

1.6 INFORMATIONAL SUBMITTALS

- A. Standard Drawings: For each MCC, as defined in UL 845.
- B. Production Drawings: For each MCC, as defined in UL 845.
- C. Coordination Drawings: Floor plans, drawn to scale, showing dimensioned layout, required working clearances, and required area above and around MCCs where pipe and ducts are prohibited. Show MCC layout and relationships between electrical components and adjacent structural and mechanical elements. Show support locations, type of support, and weight on each support. Indicate field measurements.
- D. Seismic Qualification Certificates: For MCCs, accessories, and components, from manufacturer.
 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
 2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
 3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

- E. Product Certificates: For each MCC, from manufacturer.
- F. Source quality-control reports.
- G. Field quality-control reports.
- H. Load-Current and Overload-Relay Heater List: Compile after motors have been installed, and arrange to demonstrate that selection of heaters suits actual motor nameplate full-load currents.
- I. Load-Current and List of Settings of Adjustable Overload Relays: Compile after motors have been installed, and arrange to demonstrate that switch settings for motor running overload protection suit actual motors to be protected.
- J. Warranty: Sample of special warranty.

1.7 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For MCCs, all installed devices, and components to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 01 30 00 "Contractor Submittals," include the following:
 - 1. Manufacturer's Record Drawings: As defined in UL 845. In addition to requirements specified in UL 845, include field modifications and field-assigned wiring identification incorporated during construction by manufacturer, Contractor, or both.
 - 2. Manufacturer's written instructions for testing and adjusting circuit breaker and MCP trip settings.
 - 3. Manufacturer's written instructions for setting field-adjustable overload relays.
 - 4. Manufacturer's written instructions for testing, adjusting, and reprogramming reduced-voltage, solid-state controllers.
 - 5. Manufacturer's written instructions for testing, adjusting, and reprogramming microprocessor control modules.
 - 6. Manufacturer's written instructions for setting field-adjustable timers, controls, and status and alarm points.

1.8 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Power Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.
 - 2. Control Power Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than two of each size and type.

3. Indicating Lights: Two of each type and color installed.
4. Auxiliary Contacts: Furnish one spare(s) for each size and type of magnetic controller installed.
5. Power Contacts: Furnish three spares for each size and type of magnetic contactor installed.

1.9 QUALITY ASSURANCE

- A. Source Limitations: Obtain MCCs and controllers of a single type from single source from single manufacturer.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. Comply with NFPA 70.
- D. IEEE Compliance: Fabricate and test enclosed controllers according to IEEE 344 to withstand seismic forces. "

1.10 DELIVERY, STORAGE, AND HANDLING

- A. Deliver MCCs in shipping splits of lengths that can be moved past obstructions in delivery paths.
- B. Handle MCCs according to the following:
 1. NEMA ICS 2.3, "Instructions for the Handling, Installation, Operation, and Maintenance of Motor Control Centers Rated Not More Than 600 Volts."
 2. NECA 402, "Recommended Practice for Installing and Maintaining Motor Control Centers."
- C. If stored in space that is not permanently enclosed and air conditioned, remove loose packing and flammable materials from inside MCCs; connect factory-installed space heaters to temporary electrical service.

1.11 PROJECT CONDITIONS

- A. Environmental Limitations: Rate equipment for continuous operation under the following conditions unless otherwise indicated:
 1. Ambient Temperature: Less than 0 deg F (minus 18 deg C) or exceeding 104 deg F (40 deg C), with an average value exceeding 95 deg F (35 deg C) over a 24-hour period.
 2. Ambient Storage Temperature: Not less than minus 4 deg F (minus 20 deg C) and not exceeding 140 deg F (60 deg C).
 3. Humidity: Less than 95 percent (noncondensing).

- B. Interruption of Existing Electrical Service or Distribution Systems: Do not interrupt electrical service to, or distribution systems within, a facility occupied by Owner or others unless permitted under the following conditions, and then only after arranging to provide temporary electrical service according to requirements indicated:
1. Notify Owner no fewer than 14 days in advance of proposed interruption of electrical service.
 2. Indicate method of providing temporary electrical service.
 3. Do not proceed with interruption of electrical service without Owner's written permission.
 4. Comply with NFPA 70E.
- C. Product Selection for Restricted Space: Drawings indicate maximum dimensions for MCCs, including clearances between MCCs and adjacent surfaces and other items.

1.12 COORDINATION

- A. Coordinate sizes and locations of concrete bases. Cast anchor-bolt inserts into bases.
- B. Coordinate features of MCCs, installed units, and accessory devices with remote pilot devices and control circuits to which they connect.
- C. Coordinate features, accessories, and functions of each MCC, each controller, and each installed unit with ratings and characteristics of supply circuits, motors, required control sequences, and duty cycle of motors and loads.

1.13 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components that fail in materials or workmanship within specified warranty period.
1. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURED UNITS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
1. ABB; Control Products.
 2. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
 3. General Electric Company; GE Industrial Systems.

4. Rockwell Automation, Inc.; Allen-Bradley Brand.
5. Square D; a brand of Schneider Electric.

B. General Requirements for MCCs: Comply with NEMA ICS 18 and UL 845.

2.2 FUNCTIONAL FEATURES

A. Description: Modular arrangement of main units, controller units, control devices, feeder-tap units, instruments, metering, auxiliary devices, and other items mounted in vertical sections of MCC.

B. Controller Units: Combination controller units.

1. Install units up to and including Size 3 on draw-out mountings with connectors that automatically line up and connect with vertical-section buses while being racked into their normal, energized positions.
2. Equip units in Type B and Type C MCCs with pull-apart terminal strips for external control connections.

C. Feeder-Tap Units: Through 225-A rating shall have draw-out mountings with connectors that automatically line up and connect with vertical-section buses while being racked into their normal, energized positions.

D. Future Units: Compartments fully bused and equipped with guide rails or equivalent, ready for insertion of draw-out units.

E. Spare Units: Installed in compartments indicated "spare."

2.3 INCOMING MAINS

A. Incoming Mains Location: bottom.

B. MCCB: Comply with UL 489, with interrupting capacity to meet available fault currents.

1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
2. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
3. Electronic trip circuit breakers with rms sensing; field-replaceable rating plug or field-replicable electronic trip; and the following field-adjustable settings:
 - a. Instantaneous trip.
 - b. Long- and short-time pickup levels.

- c. Long- and short-time time adjustments.
 - d. Ground-fault pickup level, time delay, and I²t response.
4. MCCB Features and Accessories:
- a. Standard frame sizes, trip ratings, and number of poles.
 - b. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor material.
 - c. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge (HID) lighting circuits.

2.4 COMBINATION CONTROLLERS

A. Full-Voltage Controllers:

- 1. General Requirements for Full-Voltage Enclosed Controllers: Comply with NEMA ICS 2, general purpose, Class A.
- 2. Magnetic Controllers: Full voltage, across the line, electrically held.
 - a. Configuration: Non-reversing.

B. Reduced-Voltage, Solid-State Controllers:

- 1. General Requirements for Reduced-Voltage, Solid-State Controllers: Comply with UL 508.
- 2. Reduced-Voltage, Solid-State Controllers: An integrated unit with power SCRs, heat sink, microprocessor logic board, door-mounted digital display and keypad, bypass contactor, and overload relay; suitable for use with NEMA MG 1, Design B, polyphase, medium-induction motors.
 - a. Configuration: Standard duty; nonreversible.
 - b. Starting Mode: Voltage ramping, current limiting.
 - c. Stopping Mode: Coast to stop.
 - d. Shorting (Bypass) Contactor: Operates automatically when full voltage is applied to motor, and bypasses the SCRs. Solid-state controller protective features shall remain active when the shorting contactor is in the bypass mode.
 - e. Shorting and Input Isolation Contactor Coils: Pressure-encapsulated type; manufacturer's standard operating voltage, matching control power or line voltage, depending on contactor size and line-voltage rating.

- f. Logic Board: Identical for all ampere ratings and voltage classes, with environmental protective coating.
- g. Adjustable acceleration-rate control using voltage or current ramp, and adjustable starting torque control with up to 400 percent current limitation for 20 seconds.
- h. SCR bridge shall consist of at least two SCRs per phase, providing stable and smooth acceleration with external feedback from the motor or driven equipment.
- i. Keypad, front accessible; for programming the controller parameters, functions, and features; shall be manufacturer's standard and include not less than the following functions:
- j. Adjusting motor full-load amperes, as a percentage of the controller's rating.
- k. Adjusting current limitation on starting, as a percentage of the motor full-load current rating.
- l. Adjusting linear acceleration and deceleration ramps, in seconds.
- m. Initial torque, as a percentage of the nominal motor torque.
- n. Adjusting torque limit, as a percentage of the nominal motor torque.
- o. Adjusting maximum start time, in seconds.
- p. Adjusting voltage boost, as a percentage of the nominal supply voltage.
- q. Selecting stopping mode, and adjusting parameters.
- r. Selecting motor thermal-overload protection class between 5 and 30.
- s. Activating and de-activating protection modes.
- t. Selecting or activating communications modes.
- u. Digital display, front accessible; for showing motor, controller, and fault status; shall be manufacturer's standard and include not less than the following:
- v. Controller Condition: Ready, starting, running, stopping.
- w. Motor Condition: Amperes, voltage, power factor, power, and thermal state.
- x. Fault Conditions: Controller thermal fault, motor overload alarm and trip, motor underload, overcurrent, shorted SCRs, line or phase loss, phase reversal, and line frequency over or under normal.

- y. Controller Diagnostics and Protection:
- z. Microprocessor-based thermal protection system for monitoring SCR and motor thermal characteristics, and providing controller over temperature and motor overload alarm and trip; settings selectable via the keypad.
- aa. Protection from line-side reverse phasing; line-side and motor-side phase loss; motor jam, stall, and underload conditions; and line frequency over or under normal.
- bb. Input isolation contactor that opens when the controller diagnostics detect a faulted solid-state component, or when the motor is stopped.
- cc. Remote Output Features:
- dd. All outputs prewired to terminal blocks.
- ee. Form C status contacts that change state when controller is running.
- ff. Form C alarm contacts that change state when a fault condition occurs.
- gg. Optional Features:
- hh. Analog output for field-selectable assignment of motor operating characteristics; 4 to 20-mA dc.
- ii. Additional field-assignable Form C contacts for alarm outputs.
- jj. Surge suppressors in solid-state power circuits providing three-phase protection against damage from supply voltage surges 10 percent or more above nominal line voltage.
- kk. Full-voltage bypass contactor operating automatically. Power contacts shall be totally enclosed, double break, and silver-cadmium oxide; and assembled to allow inspection and replacement without disturbing line or load wiring.

C. Disconnecting Means and OCPDs:

1. MCP Disconnecting Means:

- a. UL 489, NEMA AB 1, and NEMA AB 3, with interrupting capacity to comply with available fault currents, instantaneous-only circuit breaker with front-mounted, field-adjustable, short-circuit trip coordinated with motor locked-rotor amperes.
- b. Lockable Handle: Accepts three padlocks and interlocks with cover in closed position.
- c. Auxiliary contacts "a" and "b" arranged to activate with MCP handle.

D. Overload Relays:

1. Solid-State Overload Relays:

- a. Switch or dial selectable for motor running overload protection.
 - b. Sensors in each phase.
 - c. Class 10/20 selectable tripping characteristic selected to protect motor against voltage and current unbalance and single phasing.
 - d. Class II ground-fault protection, with start and run delays to prevent nuisance trip on starting.
 - e. Analog communication module.
2. NO isolated overload alarm contact.
 3. External overload reset push button.

E. Control Power:

1. Control Circuits: 120-V ac; obtained from integral CPT, with primary and secondary fuses, with CPT of sufficient capacity to operate integral devices and remotely located pilot, indicating, and control devices.
 - a. CPT Spare Capacity: 200 VA.

2.5 INSTRUMENTATION

A. Instrument Transformers: IEEE C57.13, NEMA EI 21.1, and the following:

1. PTs: IEEE C57.13; 120 V, 60 Hz, single secondary; disconnecting type with integral fuse mountings. Burden and accuracy shall be consistent with connected metering and relay devices.
2. Current Transformers: IEEE C57.13; 5 A, 60 Hz, secondary; type; single secondary winding and secondary shorting device. Burden and accuracy shall be consistent with connected metering and relay devices.
3. CPTs: Dry type, mounted in separate compartments for units larger than 3 kVA.

B. Multifunction Digital-Metering Monitor: Microprocessor-based unit suitable for three- or four-wire systems and with the following features:

1. Listed or recognized by a nationally recognized testing laboratory.
2. Inputs from sensors or 5-A current-transformer secondaries, and potential terminals rated to 600 V.

3. Switch-selectable digital display of the following values with the indicated maximum accuracy tolerances:
 - a. Phase Currents, Each Phase: Plus or minus 1 percent.
 - b. Phase-to-Phase Voltages, Three Phase: Plus or minus 1 percent.
 - c. Phase-to-Neutral Voltages, Three Phase: Plus or minus 1 percent.
 - d. Three-Phase Real Power (Megawatts): Plus or minus 2 percent.
 - e. Three-Phase Reactive Power (Megavars): Plus or minus 2 percent.
 - f. Power Factor: Plus or minus 2 percent.
 - g. Frequency: Plus or minus 0.5 percent.
 - h. Accumulated Energy, Megawatt Hours: Plus or minus 2 percent; accumulated values unaffected by power outages up to 72 hours.
 - i. Megawatt Demand: Plus or minus 2 percent; demand interval programmable from five to 60 minutes.
 - j. Contact devices to operate remote impulse-totalizing demand meter.
4. Mounting: Display and control unit flush or semiflush mounted in instrument compartment door.

2.6 ENCLOSURES

- A. Outdoor Enclosures: Type 3R, non-walk-in aisle.
 1. Finish: Factory-applied finish in manufacturer's standard color; undersurfaces treated with corrosion-resistant undercoating.
 2. Enclosure: Downward, rearward sloping roof; bolt-on rear covers for each section, with provisions for padlocking.
 3. Doors: Personnel door at each end of aisle, minimum width of 30 inches (762 mm); opening outwards; with panic hardware and provisions for padlocking.
- B. Compartments: Modular; individual doors with concealed hinges and quick-captive screw fasteners. Interlocks on units requiring disconnecting means in off position before door can be opened or closed, except by operating a permissive release device.
- C. Interchangeability: Compartments constructed to allow for removal of units without opening adjacent doors, disconnecting adjacent compartments, or disturbing operation of other units in MCC; same size compartments to permit interchangeability and ready rearrangement of units, such as replacing three single units with a unit requiring three spaces, without cutting or welding.

D. Wiring Spaces:

1. Vertical wireways in each vertical section for vertical wiring to each unit compartment; supports to hold wiring in place.
2. Horizontal wireways in bottom and top of each vertical section for horizontal wiring between vertical sections; supports to hold wiring in place.

2.7 AUXILIARY DEVICES

A. General Requirements for Control-Circuit and Pilot Devices: NEMA ICS 5; factory installed in controller enclosure cover unless otherwise indicated.

1. Push Buttons, Pilot Lights, and Selector Switches: Heavy-duty, type.
 - a. Push Buttons: Recessed types; momentary contact unless otherwise indicated.
 - b. Pilot Lights: LED types; push to test.
 - c. Selector Switches: Rotary type.
2. Elapsed-Time Meters: Heavy duty with digital readout in hours; non-resettable.

B. NO contactor auxiliary contact(s).

C. Control Relays: Auxiliary and adjustable solid-state time-delay relays.

D. Phase-Failure, Phase-Reversal, and Undervoltage and Overvoltage Relays: Solid-state sensing circuit with isolated output contacts for hard-wired connections. Provide adjustable undervoltage, overvoltage, and time-delay settings.

E. Terminals for connecting power factor correction capacitors to the load side of overload relays.

F. Spare control-wiring terminal blocks; wired.

2.8 CHARACTERISTICS AND RATINGS

A. Wiring: NEMA ICS 18, Class II-S, Type B, for starters above Size 3.

B. Control and Load Wiring: Factory installed, with bundling, lacing, and protection included. Provide flexible conductors for No. 8 AWG and smaller, for conductors across hinges, and for conductors for interconnections between shipping units.

C. Nominal System Voltage: 480Y/277 V, three phase, four wire.

D. Short-Circuit Current Rating for Each Unit: Fully rated; 42 kA.

E. Short-Circuit Current Rating of MCC: Fully rated with its main overcurrent device; 42 kA.

F. Environmental Ratings:

1. Ambient Temperature Rating: Not less than 0 deg F (minus 18 deg C) and not exceeding 104 deg F (40 deg C), with an average value not exceeding 95 deg F (35 deg C) over a 24-hour period.
2. Ambient Storage Temperature Rating: Not less than minus 4 deg F (minus 20 deg C) and not exceeding 140 deg F (60 deg C)
3. Humidity Rating: Less than 95 percent (noncondensing).
4. Altitude Rating: Not exceeding 6600 feet (2000 m), or 3300 feet (1000 m) if MCC includes solid-state devices.

G. Main-Bus Continuous Rating: 800 A.

H. Vertical-Bus Continuous Rating: 300 A.

I. Horizontal and Vertical Bus Bracing (Short-Circuit Current Rating): Match MCC short-circuit current rating.

J. Main Horizontal and Equipment Ground Buses: Uniform capacity for entire length of MCC's main and vertical sections. Provide for future extensions from both ends.

K. Vertical Phase and Equipment Ground Buses: Uniform capacity for entire usable height of vertical sections, except for sections incorporating single units.

L. Phase Bus Material: Hard-drawn copper of 98 percent conductivity, tin plated.

M. Neutral Buses: 100 percent of the ampacity of phase buses unless otherwise indicated, equipped with mechanical connectors for outgoing circuit neutral cables.

N. Ground Bus: Minimum size required by UL 845, hard-drawn copper of 98 percent conductivity, equipped with mechanical connectors for feeder and branch-circuit equipment grounding conductors. For busway feeders, extend insulated equipment grounding cable to busway ground connection and support cable at intervals in vertical run.

O. Front-Connected, Front-Accessible MCCs:

1. Main Devices: Fixed mounted.
2. Controller Units: fixed mounted.
3. Feeder-Tap Units: fixed mounted.
4. Sections front and rear aligned.

P. Bus Transition and Incoming Pull Sections: Matched and aligned with basic MCC.

Q. Future Devices: Equip compartments with mounting brackets, supports, bus connections, and appurtenances at full rating of unit.

- R. Bus-Bar Insulation: Factory-applied, flame-retardant, tape wrapping of individual bus bars or flame-retardant, spray-applied insulation. Minimum insulation temperature rating of 105 deg C.
- S. Fungus Proofing: Permanent fungicidal treatment for OCPDs and other components including instruments and instrument transformers.

2.9 SOURCE QUALITY CONTROL

- A. MCC Testing: Inspect and test MCCs according to requirements in NEMA ICS 18.
- B. MCCs will be considered defective if they do not pass tests and inspections.
- C. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and surfaces to receive MCCs, with Installer present, for compliance with requirements for installation tolerances, and other conditions affecting performance of the Work.
- B. Examine enclosed controllers before installation. Reject enclosed controllers that are wet, moisture damaged, or mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Coordinate layout and installation of MCCs with other construction including conduit, piping, equipment, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.
- B. Floor-Mounting Controllers: Install MCCs on 4-inch (100-mm) nominal thickness concrete base.
 - 1. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.
 - 2. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 3. Install anchor bolts to elevations required for proper attachment to supported equipment.
- C. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.
- D. Install fuses in each fusible switch.

- E. Install fuses in control circuits if not factory installed.
- F. Install, connect, and fuse thermal-protector monitoring relays furnished with motor-driven equipment.
- G. Comply with NECA 1.

3.3 IDENTIFICATION

- A. Comply with requirements in Section 26 05 53 "Identification for Electrical Systems" for identification of MCC, MCC components, and control wiring.
 - 1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
 - 2. Label MCC and each cubicle with engraved nameplate.
 - 3. Label each enclosure-mounted control and pilot device.
 - 4. Mark up a set of manufacturer's connection wiring diagrams with field-assigned wiring identifications and return to manufacturer for inclusion in Record Drawings.
- B. Operating Instructions: Frame printed operating instructions for MCCs, including control sequences and emergency procedures. Fabricate frame of finished metal, and cover instructions with clear acrylic plastic. Mount on front of MCCs.

3.4 CONTROL WIRING INSTALLATION

- A. Install wiring between enclosed controllers and remote devices and facility's central-control system.
- B. Bundle, train, and support wiring in enclosures.
- C. Connect selector switches and other automatic-control selection devices where applicable.
 - 1. Connect selector switches to bypass only those manual- and automatic-control devices that have no safety functions when switch is in manual-control position.
 - 2. Connect selector switches within enclosed controller circuit in both manual and automatic positions for safety-type control devices such as low- and high-pressure cutouts, high-temperature cutouts, and motor overload protectors.

3.5 CONNECTIONS

- A. Comply with requirements for installation of conduit in Section 26 05 33 "Raceways and Boxes for Electrical Systems." Drawings indicate general arrangement of conduit, fittings, and specialties.

- B. Comply with requirements in Section 26 05 26 "Grounding and Bonding for Electrical Systems."

3.6 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

- B. Acceptance Testing Preparation:

1. Test insulation resistance for each enclosed controller, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.

- C. Tests and Inspections:

1. Inspect controllers, wiring, components, connections, and equipment installation. Test and adjust controllers, components, and equipment.
2. Test insulation resistance for each enclosed controller element, component, connecting motor supply, feeder, and control circuits.
3. Test continuity of each circuit.
4. Verify that voltages at controller locations are within 10 percent of motor nameplate rated voltages. If outside this range for any motor, notify Owner before starting the motor(s).
5. Test each motor for proper phase rotation.
6. Perform each electrical test and visual and mechanical inspection stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
7. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
8. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.
9. Mark up a set of manufacturer's drawings with all field modifications incorporated during construction and return to manufacturer for inclusion in Record Drawings.

- D. Enclosed controllers will be considered defective if they do not pass tests and inspections.

- E. Prepare test and inspection reports, including a certified report that identifies enclosed controllers and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.7 STARTUP SERVICE

- A. Perform startup service.
 - 1. Complete installation and startup checks according to manufacturer's written instructions.

3.8 ADJUSTING

- A. Adjust the trip settings of MCPs and thermal-magnetic circuit breakers with adjustable, instantaneous trip elements. Initially adjust to six times the motor nameplate full-load amperes and attempt to start motors several times, allowing for motor cool-down between starts. If tripping occurs on motor inrush, adjust settings in increments until motors start without tripping. Do not exceed eight times the motor full-load amperes (or 11 times for NEMA Premium Efficient motors if required). Where these maximum settings do not allow starting of a motor, notify Owner before increasing settings.
- B. Set field-adjustable switches and program microprocessors for required start and stop sequences in reduced-voltage, solid-state controllers.

3.9 DEMONSTRATION

- A. Train Owner's maintenance personnel to adjust, operate, and maintain enclosed controllers, and to use and reprogram microprocessor-based, reduced-voltage, solid-state controllers.

**** END OF SECTION ****

**SECTION 26 28 16
ENCLOSED SWITCHES AND CIRCUIT BREAKERS**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
1. Fusible switches.
 2. Enclosures.

1.3 DEFINITIONS

- A. NC: Normally closed.
- B. NO: Normally open.
- C. SPDT: Single pole, double throw.
- D. DPDT: Double pole, double throw.

1.4 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Enclosed switches and circuit breakers shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.
1. Enclosure types and details for types other than NEMA 250, Type 1.
 2. Current and voltage ratings.
 3. Short-circuit current ratings (interrupting and withstand, as appropriate).

4. Include evidence of NRTL listing for series rating of installed devices.
5. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices, accessories, and auxiliary components.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified testing agency.
- B. Field quality-control reports.
 1. Test procedures used.
 2. Test results that comply with requirements.
 3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.
- C. Manufacturer's field service report.

1.7 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Member company of NETA or an NRTL.
 1. Testing Agency's Field Supervisor: Currently certified by NETA to supervise on-site testing.
- B. Source Limitations: Obtain enclosed switches and circuit breakers, overcurrent protective devices, components, and accessories, within same product category, from single source from single manufacturer.
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- D. Comply with NFPA 70.

1.8 PROJECT CONDITIONS

- A. Environmental Limitations: Rate equipment for continuous operation under the following conditions unless otherwise indicated:
 1. Ambient Temperature: Not less than minus 22 deg F (minus 30 deg C) and not exceeding 104 deg F (40 deg C).
 2. Altitude: Not exceeding 6600 feet (2010 m).

1.9 COORDINATION

- A. Coordinate layout and installation of switches, circuit breakers, and components with equipment served and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

PART 2 - PRODUCTS

2.1 FUSIBLE SWITCHES

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
1. Eaton.
 2. General Electric Company.
 3. Siemens Industry, Inc.
 4. Or Equal.
- B. Type HD, Heavy Duty, Single Throw, 600-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, with clip or bolt pads to accommodate fuses, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.
- C. Accessories:
1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
 2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
 3. Lugs: Mechanical type, suitable for number, size, and conductor material.
 4. Class R Fuse Kit: Provides rejection of other fuses when Class R fuses are specified.

2.2 ENCLOSURES

- A. Enclosed Switches and Circuit Breakers: NEMA AB 1, NEMA KS 1, NEMA 250, and UL 50, to comply with environmental conditions at installed location.
1. Hazardous Areas Indicated on Drawings: NEMA 250.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.
- B. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.
- C. Comply with NECA 1.

3.3 IDENTIFICATION

- A. Comply with requirements in Section 26 05 53 "Identification for Electrical Systems."
 - 1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
 - 2. Label each enclosure with engraved metal or laminated-plastic nameplate.

3.4 FIELD QUALITY CONTROL

- A. Acceptance Testing Preparation:
 - 1. Test insulation resistance for each enclosed switch and circuit breaker, component, connecting supply, feeder, and control circuit.
 - 2. Test continuity of each circuit.
- B. Tests and Inspections:
 - 1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
 - 2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
 - 3. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.
- C. Enclosed switches and circuit breakers will be considered defective if they do not pass tests and inspections.
- D. Prepare test and inspection reports, including a certified report that identifies enclosed switches and circuit breakers and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.5 ADJUSTING

- A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.

**** END OF SECTION ****

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**SECTION 26 51 13
INCANDESCENT INTERIOR LIGHTING**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Interior incandescent luminaires and lamps.
 - 2. Luminaire supports.

1.3 DEFINITIONS

- A. CCT: Correlated Color Temperature.
- B. CRI: Color Rendering Index.
- C. Lumen: Measured output of lamp and luminaire, or both.
- D. Luminaire: Complete lighting unit, including lamp, reflector, and housing.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Arrange in order of luminaire designation.
 - 2. Include data on features, accessories, and finishes.
 - 3. Include physical description and dimensions of luminaires.
 - 4. Include life, output (lumens, CCT, and CRI), and energy efficiency data.
 - 5. Include photometric data and adjustment factors based on laboratory tests, complying with IES LM-45, for each luminaire type.
 - a. Manufacturers' Certified Data: Photometric data certified by manufacturer's laboratory with a current accreditation under the NVLAP for Energy Efficient Lighting Products.
- B. Shop Drawings: For nonstandard or custom luminaires.
 - 1. Include plans, elevations, sections, and mounting and attachment details.

2. Include details of luminaire assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 3. Include diagrams for power, signal, and control wiring.
- C. Product Schedule: For luminaires and lamps. Use same designations indicated on Drawings.

1.5 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Reflected ceiling plan(s) and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
1. Luminaires.
 2. Suspended ceiling components.
 3. Structural members to which equipment will be attached.
 4. Items penetrating finished ceiling, including the following:
 - a. Other luminaires.
 - b. Access panels.
- B. Qualification Data: For testing laboratory providing photometric data for luminaires.
- C. Seismic Qualification Certificates: For luminaires, accessories, and components, from manufacturer.
1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
 2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
 3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
- D. Product Test Reports: For each luminaire, for tests performed by a qualified testing agency.
- E. Sample warranty.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For luminaires and lighting systems to include in operation and maintenance manuals.

1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Lamps: Ten for every 100 of each type and rating installed. Furnish at least one of each type.
 - 2. Globes and Guards: One for every 20 of each type and rating installed. Furnish at least one of each type.

1.8 QUALITY ASSURANCE

- A. Luminaire Photometric Data Testing Laboratory Qualifications: Luminaire manufacturer's laboratory accredited under the NVLAP for Energy Efficient Lighting Products.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Protect finishes of exposed surfaces by applying a strippable, temporary protective covering before shipping.

1.10 WARRANTY

- A. Warranty: Manufacturer and Installer agree to repair or replace components of luminaires that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Two year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Luminaires shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
- B. Seismic Performance: Luminaires and lamps shall be labeled vibration and shock resistant.
 - 1. The term "withstand" means "the luminaire will remain in place without separation of any parts when subjected to the seismic forces specified and the luminaire will be fully operational during and after the seismic event."

2.2 LUMINAIRE REQUIREMENTS

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. NRTL Compliance: Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by an NRTL.

- C. FM Global Compliance: Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by FM Global.
- D. UL Compliance: Comply with UL 1598.
- E. Lamp base complying with ANSI C81.61.
- F. Nominal Operating Voltage: 120 V ac.
- G. Lamp:
 - 1. Bulb shape complying with ANSI C79.1.
 - 2. CRI of 100. CCT of 2700 K.
 - 3. Operating at nominal voltage of 120 V.

2.3 LUMINAIRE TYPES

- A. Cylinder:
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Lithonia Lighting; Acuity Brands Lighting, Inc.
 - b. Hubbell
 - 2. Wall mounted.
 - 3. With integral mounting provisions.
 - 4. UL listed for Class I, Division I hazardous locations
 - 5. Red globe/lens with plaque noting "Fan Fail" during the event of the fan failure once the limit switch is activated.

2.4 MATERIALS

- A. Metal Parts: Free of sharp edges and burrs.
- B. Sheet Metal Components: Steel unless otherwise indicated. Form and support to prevent warping and sagging.
- C. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit re-lamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during re-lamping and when secured in operating position.
- D. Lenses, Diffusers, and Globes:

1. Glass Lighting Diffusers: clear glass.
2. Glass: Annealed crystal glass unless otherwise indicated.

E. Housings:

1. Aluminum housing with powder polyester finish, electrostatically applied.
2. Clear anodized finish.

F. Factory-Applied Labels: Comply with UL 1598. Include recommended lamps. Locate labels where they will be readily visible to service personnel, but not seen from normal viewing angles when lamps are in place.

1. Labels shall include the following lamp characteristics:
 - a. "USE ONLY" and include specific lamp type.
 - b. Lamp diameter, shape, size, wattage, and coating.
 - c. CCT and CRI for all luminaires.

2.5 METAL FINISHES

- A. Variations in finishes are unacceptable in the same piece. Variations in finishes of adjoining components are acceptable if they are within the range of approved Samples and if they can be and are assembled or installed to minimize contrast.

2.6 LIGHTING FIXTURE SUPPORT COMPONENTS

- A. Comply with requirements in Section 26 05 29 "Hangers and Supports for Electrical Systems" for channel and angle iron supports and nonmetallic channel and angle supports.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine roughing-in for luminaire to verify actual locations of luminaire and electrical connections before luminaire installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Comply with NECA 1.

- B. Install luminaires level, plumb, and square with ceilings and walls unless otherwise indicated.
- C. Install lamps in each luminaire.
- D. Supports:
 - 1. Sized and rated for luminaire weight.
 - 2. Able to maintain luminaire position after cleaning and re-lamping.
 - 3. Provide support for luminaire without causing deflection of ceiling or wall.
 - 4. Luminaire mounting devices shall be capable of supporting a horizontal force of 100 percent of luminaire weight and vertical force of 400 percent of luminaire weight.
- E. Wall-Mounted Lighting Luminaire Support:
 - 1. Attached to a minimum 20-gauge backing plate attached to wall.
- F. Comply with requirements in Section 26 05 19 "Low-Voltage Electrical Power Conductors and Cables" for wiring connections.

3.3 IDENTIFICATION

- A. Identify system components, wiring, cabling, and terminals. Install wiring labels with panel and circuit numbers on concealed junction and outlet boxes. Comply with requirements for identification specified in Section 26 05 53 "Identification for Electrical Systems."

3.4 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
 - 1. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.
- B. Luminaire will be considered defective if it does not pass operation tests and inspections.
- C. Prepare test and inspection reports.

3.5 STARTUP SERVICE

- A. Perform startup service.

**** END OF SECTION ****

**SECTION 26 51 16
FLUORESCENT INTERIOR LIGHTING**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
1. Interior fluorescent luminaires, lamps, and ballasts.
 2. Luminaire supports.

1.3 DEFINITIONS

- A. BIM: Building information model.
- B. CAD: Computer-aided design.
- C. CCT: Correlated color temperature.
- D. CRI: Color Rendering Index.
- E. Fixture: See "Luminaire."
- F. IP: International Protection or Ingress Protection Rating
- G. Lumen: Measured output of lamp and luminaire, or both.
- H. Luminaire: Complete lighting unit, including lamp, reflector, and housing.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
1. Arrange in order of luminaire designation.
 2. Include data on features, accessories, and finishes.
 3. Include physical description and dimensions of luminaires.
 4. Ballast, including BF.
 5. Include life, output (lumens, CCT, and CRI), and energy efficiency data.

6. Include photometric data and adjustment factors based on laboratory tests, complying with IESNA Lighting Measurements Testing and Calculation Guides, of each luminaire type. The adjustment factors shall be for lamps, ballasts, and accessories identical to those indicated for the luminaire as applied in this Project.

a. Retain or "Manufacturers' Certified Data" or "Testing Agency Certified Data" Subparagraph below. Retain first subparagraph if photometric data, based on testing by accredited manufacturers' laboratories, is considered adequate for luminaires in this Project. Retain second subparagraph if photometric data for one or more luminaires are based on independent laboratory tests; coordinate with the Interior Lighting Fixture Schedule on Drawings to indicate which units shall meet this requirement. See the Evaluations. Manufacturers' Certified Data: Photometric data certified by manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program (NVLAP) for Energy Efficient Lighting Products.

B. Shop Drawings: For nonstandard or custom luminaires.

1. Include plans, elevations, sections, and mounting and attachment details.
2. Include details of luminaire assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Include diagrams for power, signal, and control wiring.

C. Product Schedule: For luminaires and lamps. Use same designations indicated on Drawings.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling plan(s) and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Luminaires.
2. Structural members to which equipment and or luminaires will be attached.
3. Items penetrating finished ceiling, including the following:
 - a. Other luminaires.
 - b. Access panels.

B. Qualification Data: For testing laboratory providing photometric data for luminaires.

C. Product Certificates: For each type of ballast for bi-level and dimmer-controlled luminaires, from manufacturer.

- D. Product Test Reports: For each luminaire, for tests performed by manufacturer and witnessed by a qualified testing agency.
- E. Sample warranty.
- F. Seismic Qualification Certificates: For luminaires, accessories, and components, from manufacturer.
 - 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
 - 2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
 - 3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For luminaires and lighting systems to include in maintenance manuals.
 - 1. Provide a list of all lamp types used on Project; use ANSI and manufacturers' codes.

1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Lamps: Ten for every 100 of each type and rating installed. Furnish at least one of each type.
 - 2. Globes and Guards: One for every 20 of each type and rating installed. Furnish at least one of each type.

1.8 QUALITY ASSURANCE

- A. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by an independent agency, with the experience and capability to conduct the testing indicated, that is an NRTL as defined by OSHA in 29 CFR 1910.7, accredited under the NVLAP for Energy Efficient Lighting Products, and complying with the applicable IES testing standards.

1.9 DELIVERY, STORAGE AND HANDLING

- A. Protect finishes of exposed surfaces by applying a strippable, temporary protective covering before shipping.

1.10 WARRANTY

A. Warranty: Manufacturer and Installer agree to repair or replace components of luminaires that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Two year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Luminaires shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

B. Seismic Performance: Luminaires and lamps shall be labeled vibration and shock resistant.

1. The term "withstand" means "the luminaire will remain in place without separation of any parts when subjected to the seismic forces specified and the luminaire will be fully operational during and after the seismic event."

2.2 LUMINAIRE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. NRTL Compliance: Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by an NRTL.

C. FM Global Compliance: Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by FM Global.

D. UL Compliance: Comply with UL 1598.

E. Lamp base complying with ANSI C81.61.

F. Nominal Operating Voltage: 120 V ac.

2.3 BALLASTS FOR COMPACT FLUORESCENT LAMPS

A. Description: Electronic-programmed rapid-start type, complying with UL 935 and with ANSI C 82.11, designed for type and quantity of lamps indicated. Ballast shall be designed for full light output unless dimmer or bi-level control is indicated:

1. Lamp end-of-life detection and shutdown circuit.
2. Automatic lamp starting after lamp replacement.
3. Sound Rating: Class A.

4. Operating Frequency: 20 kHz or higher.
5. BF: 0.95 or higher unless otherwise indicated.
6. Power Factor: 0.98 or higher.

2.4 FLUORESCENT LAMPS

A. Compact Fluorescent Lamps: Four-pin, CRI of 80 (minimum), color temperature of 3500 K, average rated life of 10,000 hours at three hours of operation per start unless otherwise indicated.

1. 26 W: T4, double or triple tube, rated 1800 initial lumens (minimum).

2.5 SURFACE MOUNT, NONLINEAR

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Lithonia Lighting; Acuity Brands Lighting, Inc.
2. Hubbell

B. Universal mounting bracket.

C. Integral junction box with conduit fittings.

2.6 MATERIALS

A. Metal Parts:

1. Free of burrs and sharp corners and edges.
2. Sheet metal components shall be steel unless otherwise indicated.
3. Form and support to prevent warping and sagging.

B. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.

C. Diffusers and Globes:

1. Glass: Annealed crystal glass unless otherwise indicated.
2. Lens Thickness: At least 0.125 inch (3.175 mm) minimum unless otherwise indicated.

D. Housings:

1. Aluminum housing with polyester powder finish, electrostatically applied.
 2. Clear anodized finish.
- E. Factory-Applied Labels: Comply with UL 1598. Include recommended lamps. Locate labels where they will be readily visible to service personnel, but not seen from normal viewing angles when lamps are in place.
1. Label shall include the following lamp characteristics:
 - a. "USE ONLY" and include specific lamp type.
 - b. Lamp diameter, shape, size, wattage, and coating.
 - c. CCT and CRI for all luminaires.
- F. Clear globe/lens with plaque noting "Fan On" during the event of the fan operation once the limit switch is activated.

2.7 METAL FINISHES

- A. Variations in finishes are unacceptable in the same piece. Variations in finishes of adjoining components are acceptable if they are within the range of approved Samples and if they can be and are assembled or installed to minimize contrast.

2.8 LUMINAIRE SUPPORT COMPONENTS

- A. Comply with requirements in Section 26 05 29 "Hangers and Supports for Electrical Systems" for channel and angle iron supports and nonmetallic channel and angle supports.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine roughing-in for luminaire to verify actual locations of luminaire and electrical connections before fixture installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Comply with NECA 1.
- B. Install luminaires level, plumb, and square with ceilings and walls unless otherwise indicated.

- C. Install lamps in each luminaire.
- D. Coordinate layout and installation of luminaires and suspension system with other construction that penetrates ceilings or is supported by them.
- E. Supports:
 - 1. Sized and rated for luminaire weight.
 - 2. Able to maintain luminaire position after cleaning and re-lamping.
 - 3. Provide support for luminaire without causing deflection of ceiling or wall.
 - 4. Luminaire mounting devices shall be capable of supporting a horizontal force of 100 percent of luminaire weight and vertical force of 400 percent of luminaire weight.
- F. Wall Mounted Luminaire Support:
 - 1. Attached to a minimum 20 gauge backing plate attached to wall.
- G. Comply with requirements in Section 26 05 19 "Low-Voltage Electrical Power Conductors and Cables" and Section 26 05 33 "Raceways and Boxes for Electrical Systems" for wiring connections and wiring methods.

3.3 IDENTIFICATION

- A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 26 05 53 "Identification for Electrical Systems."

3.4 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
- B. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.
- C. Luminaire will be considered defective if it does not pass operation tests and inspections.
- D. Prepare test and inspection reports.

** END OF SECTION **

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**SECTION 26 51 19
LED INTERIOR LIGHTING**

PART 1 - PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:

1. Interior solid-state luminaires that use LED technology.
2. Lighting fixture supports.

1.3 DEFINITIONS

- A. CCT: Correlated color temperature.
- B. CRI: Color Rendering Index.
- C. Fixture: See "Luminaire."
- D. IP: International Protection or Ingress Protection Rating.
- E. LED: Light-emitting diode.
- F. Lumen: Measured output of lamp and luminaire, or both.
- G. Luminaire: Complete lighting unit, including lamp, reflector, and housing.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
1. Arrange in order of luminaire designation.
 2. Include data on features, accessories, and finishes.
 3. Include physical description and dimensions of luminaires.
 4. Include life, output (lumens, CCT, and CRI), and energy efficiency data.
 5. Photometric data and adjustment factors based on laboratory tests, complying with IESNA Lighting Measurements Testing and Calculation Guides, of each lighting fixture type. The adjustment factors shall be for

lamps and accessories identical to those indicated for the lighting fixture as applied in this Project IES LM-79 and IES LM-80.

- a. Manufacturers' Certified Data: Photometric data certified by manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products.

- B. Product Schedule: For luminaires and lamps. Use same designations indicated on Drawings.

1.5 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Reflected ceiling plan(s) and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Lighting luminaires.
2. Partitions and millwork that penetrate the ceiling or extend to within 12 inches (300 mm) of the plane of the luminaires.
3. Structural members to which luminaires will be attached.
4. Initial access modules for acoustical tile, including size and locations.
5. Items penetrating finished ceiling, including the following:
 - a. Other luminaires.
 - b. Air outlets and inlets.

- B. Qualification Data: For testing laboratory providing photometric data for luminaires.

- C. Seismic Qualification Certificates: For luminaires, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.

- D. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

- E. Product Certificates: For each type of luminaire.

- F. Product Test Reports: For each luminaire, for tests performed by manufacturer and witnessed by a qualified testing agency.

- G. Sample warranty.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For luminaires and lighting systems to include in operation and maintenance manuals.
1. Provide a list of all lamp types used on Project; use ANSI and manufacturers' codes.

1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Lamps: Ten for every 100 of each type and rating installed. Furnish at least one of each type.
 2. Diffusers and Lenses: One for every 100 of each type and rating installed. Furnish at least one of each type.
 3. Globes and Guards: One for every 20 of each type and rating installed. Furnish at least one of each type.

1.8 QUALITY ASSURANCE

- A. Luminaire Photometric Data Testing Laboratory Qualifications: Luminaire manufacturer's laboratory that is accredited under the NVLAP for Energy Efficient Lighting Products.
- B. Provide luminaires from a single manufacturer for each luminaire type.
- C. Each luminaire type shall be binned within a three-step MacAdam Ellipse to ensure color consistency among luminaires.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Protect finishes of exposed surfaces by applying a strippable, temporary protective covering before shipping.

1.10 WARRANTY

- A. Warranty: Manufacturer and Installer agree to repair or replace components of luminaires that fail in materials or workmanship within specified warranty period.
- B. Warranty Period: Five year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Luminaires shall withstand the effects of earthquake motions determined according to ASCE/SEI 7

B. Seismic Performance: Luminaires and lamps shall be labeled vibration and shock resistant.

1. The term "withstand" means "the luminaire will remain in place without separation of any parts when subjected to the seismic forces specified and the luminaire will be fully operational during and after the seismic event."

2.2 LUMINAIRE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. NRTL Compliance: Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by an NRTL.

C. FM Global Compliance: Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by FM Global.

D. Bulb shape complying with ANSI C79.1.

E. CRI of minimum 80. CCT of 4100 K.

F. Rated lamp life of 50,000 hours.

G. Lamps dimmable from 100 percent to 0 percent of maximum light output.

H. Internal driver.

I. Nominal Operating Voltage: 120 V ac.

1. Lens Thickness: At least 0.125 inch (3.175 mm) minimum unless otherwise indicated.

J. Housings:

1. Extruded-aluminum housing and heat sink.
2. Clear powder-coat finish.

2.3 LINEAR INDUSTRIAL

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Cooper Lighting, an Eaton business.
2. Lighting Science Group.
3. Lithonia Lighting; Acuity Brands Lighting, Inc.

B. Minimum 5,000 lumens. Minimum allowable efficacy of 80 lumens per watt.

C. Housing and heat sink rated to the following:

1. Class 1, Division 1 Group(s) C and D.

2.4 MATERIALS

A. Metal Parts:

1. Free of burrs and sharp corners and edges.
2. Sheet metal components shall be steel unless otherwise indicated.
3. Form and support to prevent warping and sagging.

B. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.

C. Diffusers and Globes:

1. Tempered borosilicate glass tubes

D. Housings:

1. Heavy duty housing and end caps, copper-free aluminum.
2. 316 Stainless Steel external hardware.
3. Clear powder-coat finish.

E. Factory-Applied Labels: Comply with UL 1598. Include recommended lamps. Locate labels where they will be readily visible to service personnel, but not seen from normal viewing angles when lamps are in place.

1. Label shall include the following lamp characteristics:
 - a. "USE ONLY" and include specific lamp type.
 - b. Lamp diameter, shape, size, wattage, and coating.
 - c. CCT and CRI for all luminaires.

2.5 METAL FINISHES

A. Variations in finishes are unacceptable in the same piece. Variations in finishes of adjoining components are acceptable if they are within the range of approved Samples and if they can be and are assembled or installed to minimize contrast.

2.6 LUMINAIRE FIXTURE SUPPORT COMPONENTS

- A. Comply with requirements in Section 26 05 29 "Hangers and Supports for Electrical Systems" for channel and angle iron supports and nonmetallic channel and angle supports.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine roughing-in for luminaire to verify actual locations of luminaire and electrical connections before fixture installation. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Comply with NECA 1.
- B. Install luminaires level, plumb, and square with ceilings and walls unless otherwise indicated.
- C. Supports:
 - 1. Sized and rated for luminaire weight.
 - 2. Able to maintain luminaire position after cleaning and relamping.
 - 3. Provide support for luminaire without causing deflection of ceiling or wall.
 - 4. Luminaire mounting devices shall be capable of supporting a horizontal force of 100 percent of luminaire weight and vertical force of 400 percent of luminaire weight.
- D. Wall-Mounted Luminaire Support:
 - 1. Attached to a minimum 20 gauge backing plate attached to wall structural members.
- E. Comply with requirements in Section 26 05 19 "Low-Voltage Electrical Power Conductors and Cables" for wiring connections.

3.3 IDENTIFICATION

- A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 26 05 53 "Identification for Electrical Systems."

3.4 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.
2. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery power and retransfer to normal.

B. Luminaire will be considered defective if it does not pass operation tests and inspections.

C. Prepare test and inspection reports.

**** END OF SECTION ****

**SECTION 31 05 16
AGGREGATE AND ROCK PRODUCTS FOR EARTHWORK**

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Materials and installation of rock, stone, crushed rock, rock dust, gravel and sand.
- B. Materials used for asphalt concrete are specified in Section 32 12 16.
- C. Materials used for concrete aggregate are specified in Section 03 30 00.
- D. Except as modified herein, aggregate and rock products shall conform to Standard Specifications for Public Works Construction (Greenbook) Section 200.

1.2 RELATED WORK

- A. Section 01 30 00: Contractor Submittals
- B. Section 01 40 00: Quality Control
- C. Section 01 53 00: Protection of Existing Facilities
- D. Section 01 55 00: Site Access and Storage
- E. Section 01 60 00: Products, Materials, Equipment and Substitutions
- F. Section 02 41 14: Paving Removal and Resurfacing
- G. Section 31 23 33: Trenching and Backfilling
- H. Section 32 12 16: Asphalt Paving

1.3 QUALITY ASSURANCE

- A. Rock products shall be clean, hard, sound, durable, uniform in quality, and free of any detrimental quality of soft, friable, thin, elongated or laminated pieces, disintegrated material, organic matter, oil, alkali, or other deleterious substance.
- B. Plant testing shall include the following:

ITEM	TEST FOR	TEST STANDARD (ASTM OR OTHER TEST STANDARD)	FREQUENCY	FIRST TEST PAID FOR BY	RETESTS PAID FOR BY
Crushed Rock and Rock Dust	Sieve Analysis	California Test Method 202 Meet requirements below in Part 2	1 each source for each gradation used	Contractor	Contractor
	Fractured Faces	Meet requirements below in Part 2	1 each sieve test	Contractor	Contractor
	Gravel	Meet requirements below in Part 2	1 each sieve test	Contractor	Contractor
Crushed Rock	Percentage Wear	ASTM C131 Meet requirements below in Part 2	1 each sieve test	Contractor	Contractor

- C. All percentages referred to herein shall be by weight.

1.4 REFERENCES

- A. ASTM C127 Density, Relative Density (Specific Gravity), and Absorption of Coarse Aggregate
- B. ASTM C131 Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
- C. ASTM C136 Sieve Analysis of Fine and Coarse Aggregates
- D. ASTM D1556 Density and Unit Weight of Soil in Place by the SandCone Method
- E. ASTM D4253 Maximum Index Density and Unit Weight of Soils Using Vibratory Table
- F. ASTM D4254 Maximum Index Density and Unit Weight of Soils and Calculation of Relative Density
- G. ASTM D6938 In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)
- H. SSPWC Standard Specifications for Public Works Construction (Greenbook) Section 200 "Rock Materials"

1.5 SUBMITTALS

- A. Furnish the following submittals.

SUBMITTAL	DESCRIPTION	
Test Results	Required for all rock products	

- B. Refer to Section 01 30 00 for definition of requirements for catalog data and certificates of compliance.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Refer to contract documents for delivery storage and handling requirements.

1.7 PAYMENT

- A. Payment for Work in this section shall be included as part of the lump-sum for Bid Item No. 1.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Refer to Section 01 60 00 for basic requirements for products and materials.
- B. Rock products shall be clean, hard, sound, durable, uniform in quality and free of any detrimental quantity of soft, friable, thin, elongated, or laminated pieces, disintegrated material, organic matter, oil, alkali, or other deleterious substance. Unless otherwise specified, products shall meet the requirements of Section 200 of the Standard Specifications for Public Works Construction (Greenbook).

- C. Owner's Representative may waive percentage wear requirements in Section 200 of the Greenbook, provided durability index requirements shown are met.
- D. Crushed rock and rock materials shall meet the gradations indicated by the Standard Specifications for Public Works (Greenbook) Table 200-1.2.(A).
- E. Where called for on Plans, Greenbook Crushed Aggregate Base shall meet the gradation indicated by the Standard Specifications for Public Works (Greenbook) Table 200-2.2.2.
- F. Where called for on Plans, "Crushed Miscellaneous Base" shall meet the gradation indicated by the Standard Specifications for Public Works (Greenbook) Table 200-2.4.2 (A).

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Furnish and install aggregate and rock products at locations shown on Plans and Submittals.
- B. The following installation standards shall be followed:
 - 1. Requirements of contract-referenced soils reports and investigations.
 - 2. Applicable OSHA and Cal OSHA regulations
 - 3. Other applicable building code requirements
- C. Refer variances between the above documents and Contract Documents to Owner's Representative.

3.2 FIELD QUALITY CONTROL

- A. Owner's Representative will provide continuous inspection of rock products as placed and compacted.
- B. Owner's Representative will observe and test fills and based on laboratory results will determine whether fills have been placed in accordance with Contract Documents.
- C. Owner-approved soils-testing firm hired by Contractor shall provide laboratory results to Owner's Representative who will determine whether fills have been placed in accordance with Contract Documents.
- D. Field testing shall include the following:

ITEM	TEST FOR	TEST STANDARD (ASTM OR OTHER TEST STANDARD)	FREQUENCY	FIRST TEST PAID FOR BY	RETESTS PAID FOR BY
Backfill	Sampling	ASTM D75	As directed	Owner	Contractor

ITEM	TEST FOR	TEST STANDARD (ASTM OR OTHER TEST STANDARD)	FREQUENCY	FIRST TEST PAID FOR BY	RETESTS PAID FOR BY
or Soil Prepared in Place	Sieve Analysis	ASTM C136 or California Test Method 202	As directed	Owner	Contractor
	Sand Equivalence	California Test Method 217	As directed	Owner	Contractor

- E. Allow sufficient time for testing and evaluation of results before material is needed. Owner's Representative will be sole and final judge of suitability of all materials.
- F. Do not use materials in question pending test results.
- G. Contractor shall remove unsatisfactory material, re-compact, adjust moisture or compaction methods, place new material, and perform other operations necessary to meet Contract requirements as directed by Owner's Representative whose decisions and directions will be considered final on these matters.

** END OF SECTION **

**SECTION 31 10 00
SITE CLEARING**

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Clearing, grubbing, stripping, and preparing site for construction operations.

1.2 RELATED WORK

- A. Section 01 30 00: Contractor Submittals
- B. Section 01 40 00: Quality Control
- C. Section 01 53 00: Protection of Existing Facilities
- D. Section 01 55 00: Site Access and Storage
- E. Section 01 60 00: Products, Materials, Equipment and Substitutions
- F. Section 31 23 33: Trenching and Backfilling

1.4 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workmen trained and experienced in necessary trades and crafts and completely familiar with specified requirements and methods for proper performance of Work of this section.

1.5 REFERENCES

- A. 2015 Greenbook
- B. 2015 Whitebook
- C. California Building Code (CBC)
- D. California Fire Code (CFC)

1.6 PAYMENT

- A. Payment for Work in this section shall be included as part of the lump-sum for Bid Item No. 1.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 PREPARATION

- A. Inspect site as to nature, location, size and extent of vegetative material to be removed.
- B. Before beginning work, consult with Owner's Representative, identify limits of clearing, grubbing and stripping and mark in field with, fencing, stakes and string, paint, chalk or other method acceptable to Owner's Representative.

- C. Limits of clearing, grubbing and stripping shall include excavation and embankment areas required to be disturbed to construct improvements shown on Plans. Limits shall also include stockpile areas accepted by Owner's Representative.
- D. Provide clearing, grubbing and stripping at locations shown on Plans and submittals and as required to accommodate Work.

3.2 INSTALLATION

- A. The following installation standards shall be followed:
 - 1. Manufacturer's installation and warranty requirements
 - 2. Applicable OSHA and Cal OSHA regulations
 - 3. Other applicable building and fire code requirements.
- B. Clearing shall proceed as follows:
 - 1. Remove and legally dispose of trees, snags, stumps, shrubs, brush, limbs, and other vegetative growth.
 - 2. Remove all evidence of their presence from surface including sticks and branches greater than 1-inch diameter or thickness.
 - 3. Remove and legally dispose of trash piles and rubbish.
 - 4. Protect structures, piping and equipment above and below ground, trees, shrubs, vegetative growth and fencing not designated for removal.
- C. Grubbing shall proceed as follows:
 - 1. Remove and legally dispose of wood or root matter below ground remaining after clearing, including stumps, trunks, roots, or root systems greater than 1-inch diameter or thickness to a depth 12 inches below existing or finished grade, whichever is lower.
- D. Stripping shall proceed as follows:
 - 1. Remove and legally dispose of all organic sod, topsoil, grass and grass roots and other objectionable material remaining after clearing and grubbing from areas designated to be stripped.
 - 2. Stockpile and retain topsoil material onsite for dressing backfill areas before planting.
- E. Do not burn combustible materials. Remove cleared, grubbed and stripped material from site (excluding topsoil) and dispose of in accordance with local laws, codes and ordinances.

**** END OF SECTION ****

**SECTION 31 23 19
DEWATERING**

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Dewatering and disposal of groundwater if this is required for the Work of this contract.

1.2 RELATED WORK

- A. Section 01 30 00: Contractor Submittals
- B. Section 01 40 00: Quality Control
- C. Section 01 53 00: Protection of Existing Facilities
- D. Section 01 55 00: Site Access and Storage
- E. Section 01 60 00: Products, Materials, Equipment and Substitutions
- F. Section 31 23 33: Trenching and Backfilling

1.3 SYSTEM DESCRIPTION

- A. Provide continuous control of water throughout construction including weekends and holidays, and during work shutdowns.
- B. Comply with applicable permit conditions, building codes and standards.
- C. Dewater, treat and dispose of water so as not to cause injury or nuisance to public or private property.

1.4 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workers trained and experienced in necessary trades and crafts and completely familiar with specified requirements and methods for proper performance of Work of this section.

1.5 REFERENCES

- A. City of San Diego, Public Utilities Department, Industrial Waste Discharge Permit; specifically a requirement to submit a form entitled "Request for Authorization to Discharge Extracted Groundwater to Sewer", and obtain approval for proposed discharge of groundwater to the lift station wetwell.
- B. City of San Diego requirements for compliance with National Pollution Discharge Elimination System (NPDES) Permit for "Deminimus" Discharges to Storm Drain System (should this pertain to an approved discharge method different than what is described herein).
- C. Regional Water Quality Control Board Discharge Permit Requirements (should this pertain to an approved discharge method different than what is described herein).

D. County Flood Control District Permit Discharge Permit Requirements (should this pertain to an approved discharge method different than what is described herein)..

1.6 SUBMITTALS

A. Furnish the following submittals.

SUBMITTAL	DESCRIPTION	
Water Control Plan	<p>Submit water control plan as informational submittal no less than 60 days after notice to proceed or 30 days before installation of water control systems. Review will be solely for conformance to requirements of this section with no warranty of whether reviewer believes the plan will work. Contractor shall assume a dewatering rate of 50 gallons per minute when preparing the Water Control Plan. A change order will be issued if the required dewatering rate exceeds the assumed rate identified above, to reimburse Contractor for additional costs associated with furnishing, installing and operating a larger pump and related water disposal system..</p> <p>Describe the following:</p> <ul style="list-style-type: none"> • Applicable permit requirements • Equipment proposed • Methods proposed • Standby equipment proposed • Capacities of pumps, motors and engines, including standby equipment • Power supply • Standby power • Pollution control facilities • Proposed discharge locations (Laguna SOCWA Lift Station) • Provisions for immediate temporary water supply • Water control schedule • Operation procedures • Equipment removal and/or abandonment procedures 	
Preconstruction Photographs	Before dewatering, photograph and document existing cracks of concrete and masonry surfaces which may subsequently be attributed to dewatering operations.	
Amended Water Control Plan	Required if system is modified during installation or operation	
Catalog Data	Submit for treatment equipment, pumps, prime movers and metering and monitoring equipment proposed	
Shop Drawings	Show locations, dimensions and relationships of elements of each system including well points, piping, silt/sand traps, sumps, discharge lines, monitoring points treatment equipment and discharge points	
Engineering Calculations	Required for per engineering calculations requirements. Demonstrate adequacy of proposed dewatering systems and components.	
Flow Data	Submit flow measurements daily for previous 24 hours (midnight to midnight)	

B. Refer to Section 01 30 00 for definition of requirements for shop drawings and engineering calculations.

1.7 PAYMENT

- A. Payment for Work in this section shall be included as part of the lump-sum for Bid Item No. 1.
- B. The cost for any and all permits that are required to implement the approved dewatering plan shall be included as part of the lump-sum for Bid Item No. 1.
- C. The cost to obtain water quality samples and associated testing, as may be needed to obtain to obtain an industrial waste discharge permit (or other type of permit), shall be included as part of the lump-sum for Bid Item No. 1.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 PREPARATION

- A. Make field measurements needed for dewatering before submitting water control plan. Make minor changes in dimensions and alignments as needed to avoid utilities or structural conflicts.
- B. Do not begin installing dewatering equipment until submittals have been accepted by Owner's Representative.
- C. Provide adequate backup systems to control water. Provide sufficient redundancy in each system to keep excavation free of water in event of component failure.
- D. Electrical service used for dewatering shall be dedicated solely for groundwater control.
- E. Provide 100% emergency power backup with automatic startup and switchover in event of power failure.

3.2 INSTALLATION

- A. Refer to contract documents for basic execution and installation requirements.

3.3 DEWATERING

- A. Groundwater will be discharged into the Influent Manhole (to be pumped into the existing 16-inch diameter forcemain by either the permanent sewage pumps or by the bypass pumping system). Coordinate with Owner for schedule, quantity of discharge, and dewatering requirements.
- B. Provide Baker tanks for settling and clearing groundwater prior to discharge.
- C. Comply with requirements of permitting agencies.
- D. Continuously control water throughout construction, including weekends, holidays and work stoppages.

- E. Do not shut down dewatering without written permission from Owner's Representative.
- F. Maintain excavations free of water, regardless of water's source, and until excavations are backfilled to final grade.
- G. Design and operate dewatering systems with proper size and capacity:
 - 1. To permit excavating, pipe laying, concrete work and all other construction in the dry.
 - 2. To lower groundwater two feet below lowest excavation point.
 - 3. To prevent hydrostatic uplift forces until backfill is in place.
 - 4. To allow concrete to reach its 28-day compressive strength in the dry.
 - 5. To prevent loss, caving, loosening or softening of ground as water is removed.
 - 6. To avoid inducing settlement or damage to existing facilities, completed Work or adjacent property.
 - 7. To relieve artesian pressures and resultant uplift of excavation bottom.
- H. Modify water control system after installation and while in operation if it causes or threatens damage to adjacent property, structures or utilities.
- I. Control surface drainage and prevent it from entering excavations as follows:
 - 1. Intercept and divert runoff away from Work using dikes, curb walls, ditches, sumps, sand bags or other means.
 - 2. Design surface drainage system to minimize erosion on or off the site.
- J. Provide supplemental ditches and sumps for groundwater only as needed to collect water from local seeps and from pipe zone backfill of utilities intersecting the excavation. Do not use ditches and sumps as primary dewatering means.
- K. Do not convey groundwater in open ditches or trenches.
- L. Upon receiving written authorization from Owner's Representative, remove dewatering system as follows:
 - 1. Abandon monitoring points in conformance with applicable regulatory requirements.
 - 2. Dewatering system components shall remain Contractor's property.
 - 3. Upon completion of dewatering, restore ground surfaces to preconstruction conditions.

3.4 FIELD QUALITY CONTROL

A. Field testing shall include:

ITEM	TEST FOR	TEST STANDARD (ASTM OR OTHER TEST STANDARD)	FREQUENCY	FIRST TEST PAID FOR BY	RETESTS PAID FOR BY
Water Volume Removed	Water Volume Removed Daily	Use metering device or procedure accepted by Owner's Representative and calibrated within previous 60 days	Continuous metering	Contractor	Contractor
Quality of Disposed Water	Water Quality	Regional Water Quality Control Board and County Flood Control District permit requirements	As required by permit	Contractor	Contractor

3.5 PROTECTION

- A. Disposal of water shall not cause silting or overflow of the Lift Station's wetwell.
- B. Disposal of water shall not damage existing facilities, completed work or adjacent property.
- C. Do not cause flooding by overloading or blocking flow of discharged water.
- D. Any structure, paving or utility that becomes unstable or vulnerable to settlement or cracking that may be attributed to dewatering shall be supported immediately using procedures such as bracing, underpinning or compaction grouting.

**** END OF SECTION ****

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**SECTION 31 23 33
TRENCHING AND BACKFILLING**

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Trench excavation activities as required to complete Work under wet and dry conditions in whatever material or class of material is encountered, including:
1. Contacting and notifying underground utilities, no less than 48-hours before excavating in accordance with the contract documents.
 2. Compliance with State and Federal safety regulations.
 3. Designing, furnishing, placing, and removing all sheeting, shoring and bracing needed to safely support sides of excavations.
 4. Compliance with applicable agencies' permit conditions for Work in public or railroad right-of-way, and for Work on private property.
 5. Loosening, excavating, removing, loading, and transporting excess soil from excavations.
 6. Stockpiling, exporting and importing material.
 7. Pumping, ditching, draining, and other required measures to remove or exclude water.
 8. Supporting and protecting structures above and below ground.
 9. Maintaining trees not permitted to be removed.
 10. Preparing and stabilizing subgrade for pipe, paving and structures.
 11. Backfilling around structures and all backfilling of trenches and pits.
 12. Transporting, depositing, and compacting fill where required.
 13. Compaction testing (where stipulated as a Contractor responsibility in Section 3.3)
 14. Legal disposal of cleared, grubbed and excess excavated materials.
 15. Cleaning up debris, papers and loose rocks.
 16. Restoring fences and other disturbed property.
 17. All other incidental earthwork and supplementary operations needed to complete Work.

- B. Excavations for appurtenant structures including manholes, transition structures, junction structures, vaults, valve boxes, catch basins, thrust blocks, and boring pits shall be considered as trench excavation.
- C. Excavation shall include removal of all water and materials of any nature which interfere with construction work. Removal of water to levels below structure subgrade will be necessary only where required by Contract Documents.
- D. Excavation for pipe and conduit work shall be by open trench unless otherwise shown. Should Contractor elect to tunnel or jack any portion not so specified, they shall first obtain acceptance from Owner's Representative, and payment will be limited to prices bid for open excavation.
- E. Except as modified herein, earthwork shall conform to Standard Specifications for Public Works Construction (Greenbook) Section 300.

1.2 RELATED WORK

- A. Section 01 30 00: Contractor Submittals
- B. Section 01 40 00: Quality Control
- C. Section 01 53 00: Protection of Existing Facilities
- D. Section 01 55 00: Site Access and Storage
- E. Section 01 60 00: Products, Materials, Equipment and Substitutions
- F. Section 03 30 00: Cast-in-Place Concrete
- G. Section 31 05 16: Aggregate and Rock Products for Earthwork
- H. Section 31 10 00: Site Clearing
- I. Section 31 23 19: Dewatering
- J. Section 32 12 16: Asphalt Paving
- K. Section 32 90 00: Restoration of Existing Landscaping
- L. Section 33 05 26: Utility Identification

1.4 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workmen trained and experienced in necessary trades and crafts and completely familiar with specified requirements and methods for proper performance of Work of this section.

1.5 REFERENCES

- A. ASTM C12 Installing Vitrified Clay Pipe Lines
- B. ASTM C143 Slump of Hydraulic Cement Concrete
- C. ASTM C136 Sieve Analysis of Fine and Coarse Aggregates
- D. ASTM C1479 Installation of Precast Concrete Sewer, Storm Drain, and Culvert Pipe
- E. ASTM D1556 Density and Unit Weight of Soil in Place by Sand Cone Method
- F. ASTM D1557 Laboratory Compaction Characteristics of Soil Using Modified Effort
- G. ASTM D2321 Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Application
- H. ASTM D4253 Maximum Index Density and Unit Weight of Soils Using Vibratory Table
- I. ASTM D4254 Maximum Index Density and Unit Weight of Soils and Calculation of Relative Density
- J. ASTM D6938 In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)

- K. AWWA C600 Installation of Ductile Iron Water Mains and Their Appurtenances
- L. AWWA C604 Installation of Steel Water Pipe – 4” and Larger
- M. AWWA C605 Underground Installation of Polyvinyl Chloride (PVC) and Molecularly Oriented Polyvinyl Chloride (PVCO) Pressure Pipe and Fittings
- N. AWWA M9 Concrete Pressure Pipe
- O. AWWA M11 Steel Pipe – A Guide for Design and Installation
- P. AWWA M23 PVC Pipe – Design and Installation
- Q. AWWA M41 Ductile Iron Pipe and Fittings
- R. AWWA M55 PE Pipe – Design and Installation
- S. California Test Method 202 Sieve Analysis of Fine and Coarse Aggregates
- T. California Test Method 216 Relative Compaction of Untreated and Treated Soils and Aggregates
- U. California Test Method 217 Sand Equivalent
- V. SSPWC Standard Specifications for Public Works Construction (Greenbook) Section 306 “Open-Trench Excavations”

1.6 SUBMITTALS

- A. Furnish the following submittals.

SUBMITTAL	DESCRIPTION	
Permits	Copies of permits obtained for excavation, grading, etc. required by state and local governing authorities	
Certificate of Compliance	Submit affidavit of compliance with California Construction Safety Order requirements prior to beginning excavation on any trench or excavation. Affidavit shall certify compliance with all shoring, bracing, sloping or other protective system provisions required by California Construction Safety Orders for worker protection from hazard of caving ground during excavation.	

- B. Refer to Section 01 30 00 for definition of requirements for catalog data and certificates of compliance.

1.7 DELIVERY, STORAGE AND HANDLING

- A. Refer to contract documents for delivery storage and handling requirements.

1.8 PAYMENT

- A. Payment for Work in this section shall be included as part of the lump-sum for Bid Item No. 1.
- B. In absence of pay items for contaminated soils, Contractor shall be entitled to payment as Extra Work for documented costs incurred by Contractor for removing, segregating, covering, and legally disposing of contaminated soils. Contractor shall not be entitled to payment for imported material to replace contaminated soils.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Acceptable Manufacturers include:

ITEM	MANUFACTURER	MANUFACTURER LOCATION
Buried Pipe Warning- Locating and Identification Tape	See Section 33 05 26	

2.2 MATERIALS

A. Refer to Section 01 60 00 for basic requirements for products and materials.

B. Refer to Section 31 05 16 for basic requirements for aggregate and rock products.

C. The following definitions shall apply to soil and backfill:

ITEM	MATERIAL	SPECIFICATION
Granular Material	Sand or Gravel	California Test Method 217 minimum sand equivalence of 30 Not more than 20% of material shall pass through 200-mesh sieve.
Imported Sand	Sand	California Test Method 217 minimum sand equivalence of 30
Suitable Soil Material	Imported or Excavated Material Meeting Specification	Material free from shale, sod, stones, concrete and clods over 4" diameter, roots, trash, lumber, organic material, ashes and other debris considered unsuitable by Owner. Material shall have no unusual color or sulfide odor. Compact to specified densities.
Cement-Sand Slurry	Cement (94-lb sacks per cubic yard of mix)	1 sack per cubic yard minimum, and not less than that required by applicable agency encroachment permits
	Maximum Slump	6" maximum per ASTM C143
Native Material	Material obtained from required site excavations When native material is unsuitable for use in backfill, it shall be disposed of off-site and suitable material capable of being compacted to required relative density shall be furnished by Contractor at their expense.	
Import Material	Owner-accepted material obtained from off-site borrow areas.	
Buried Pipe Warning- Locating and Identification Tape	See Section 33 05 26. See section on appropriate utility pipe or conduit material for required message	

D. Soil and backfill materials for pipelines and utilities shall be prepared to the following specifications:

ITEM	MATERIAL	SPECIFICATION
Backfill for Over-Excavation Beneath Pipes	Cement-Sand Slurry	Cement-sand slurry mix specified above
	Suitable Soil Material (where cement-sand slurry not required)	90% compaction per ASTM D1557 or California Test Method 216
Backfill of Tunnels beneath Concrete Flatwork	Sand	90% compaction per ASTM D1557 or California Test Method 216
Pipe Zone Material (Material from 6" below pipe to plane 12" above top of pipe)	Native or Imported Granular Material	Place buried identification tape where specified 90% / 95% compaction per ASTM D1557 or California Test Method 216

ITEM	MATERIAL	SPECIFICATION
		or California Test Method 217 Minimum sand equivalence of 30 Material shall also be suitable soil material as defined above. Maximum lifts vary with equipment. See below.
Trench Zone Material (Material in Pipe Trench above Pipe Zone and below any Street Zone)	Cement-Sand Slurry Suitable Soil Material (where cement-sand slurry not required)	Cement-sand slurry mix specified above 90% compaction per ASTM D1557 or California Test Method 216 Maximum lifts vary with equipment. See below. May contain stones, asphalt pavement or concrete of up to 6" in largest dimension so long as such solids are completely surrounded by fines so no voids are present in backfill as placed. No material >2" in any dimension shall be placed within one foot of any pipe, valve, or structure. All backfill within 24" of ductile-iron fittings or valves shall be clean, washed sand. Provide buried pipe warning and locator tape in pipe trench 18" above pipe.
Street Zone Material (Base material in pipe trench below pavement subgrade to depth of 30" below finished road surface.	Crushed Aggregate Base Material	95% compaction per ASTM D1557 or California Test Method 216 Conform to Section 200-2.2, crushed aggregate base of SSPWC Contractor may substitute on-site materials conforming to Section 200-2.5, Processed Miscellaneous Base of SSPWC Maximum lifts vary with equipment. See below. Material shall also be suitable soil material as defined above. Stones concrete and clods smaller than specified limit may not exceed 20% of backfill volume over any pipe segment. Place in 8" maximum lifts.
Surface Zone Material (upper 12" below finish surface in unimproved or landscaped areas)	Topsoil per Section 32 90 00	80% compaction per ASTM D1557 or California Test Method 216 Maximum lifts vary with equipment. See below.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Contractor's attention is directed to possible existence of pipe and other underground improvements which may or may not be shown on Plans. Preserve and protect any such improvements whether shown or not. Where necessary to remove and replace or to relocate such improvements to prosecute Work, improvements shall be removed, maintained, and permanently replaced by Contractor at their expense, except as otherwise provided in Contract Documents.
- B. Control of runoff and groundwater shall comply with the following:

1. Control grading to prevent water running into excavations. Do not obstruct surface drainage. Provide swales, gutters temporary drains or other means of channeling flow without interruption around excavations.
 2. Preserve existing drainage patterns except as otherwise shown. Where construction methods cause temporary obstruction of drainage patterns, provide temporary facilities adequate for expected flows and a means of emergency removal of obstruction.
 3. Procure permit from appropriate Regional Water Quality Control Board for all groundwater dewatering operations.
 4. Provide and maintain ample means and devices and promptly remove and properly dispose of all water from any source entering excavation or other parts of Work. Dewatering methods shall ensure preservation of final lines and grades of bottoms of excavations. Said methods may include well points, sump points, suitable rock or gravel placed below required bedding for drainage and pumping purposes, temporary pipelines, and other means that will not be detrimental to proposed construction. Contractor is responsible for obtaining all water discharge permits required.
 5. Dewatering for structures and pipelines shall commence when groundwater is first encountered and shall continue until water can be allowed to rise in accordance with provisions of this section.
 6. Do not place concrete slabs, footings or floors in water. Do not allow water to rise over Work until concrete or mortar has set at least 8 hours. Do not allow water to rise unequally against walls for 28 days. Do not allow groundwater to rise around pipe until jointing compound in joints has set hard.
 7. Dispose of water in suitable manner without damage to adjacent property. Do not drain water into Work built or under construction without prior consent of Owner's Representative. Dispose of water according to permits and in such manner as not to be a menace to public health and public or private property.
- C. Remove and replace asphalt paving improvements per Section 32 12 16.
- D. Per Section 01 56 00 the use of explosives will not be permitted to assist with excavation or for any other reason related to the construction of the Work of this contract.
- E. Protection for open excavations shall comply with latest revision of rules, orders and regulations of Division of Industrial Safety of State of California. Nothing contained in these Contract Documents shall be construed as relieving Contractor of full responsibility for providing shoring, bracing, sloping or other provisions adequate to guarantee worker protection and safety.
1. Vertical supports including steel H-beams and piles shall be drilled into place, except final 4' may be driven.

2. Where drilling is impracticable because of rocks or running sand, Owner's Representative may accept placing of vertical supports by means other than drilling, provided Contractor assumes sole responsibility to protect existing surface and subsurface improvements in place.
 3. If sheeting is used for trench support, no sheeting shall remain in trench upon project completion except where removal of portions of said sheeting is impracticable in opinion of Owner's Representative.
 4. Access ladders shall be provided within 25 feet of all workers as required by OSHA regulations.
- F. No material shall cause undue interference with public travel. Provide free access to all fire hydrants, water valves, meters, and private drives, or other property or facilities that may have routine or emergency use.
- G. Do not deposit backfill against new concrete structures until concrete has developed specified 28-day compressive strength.

3.2 INSTALLATION

- A. Furnish and install excavation and fill work at locations shown on Plans and Submittals.
- B. The following installation standards shall be followed:
1. Requirements of contract-referenced soils reports and investigations.
 2. Manufacturer's installation and warranty requirements
 3. Applicable OSHA and Cal OSHA regulations
 4. California Building Code Chapter 18 "Soils and Foundations."
 5. Standard Specifications for Public Works Construction (Greenbook) Section 306-1 "Open Trench Excavations"
 6. Other applicable building code requirements
- C. Refer variances between above documents and Contract Documents to Owner's Representative.
- D. Earthwork within public rights-of-way controlled by a state, county or city, or earthwork within railroad rights-of-way shall be in accordance with requirements and provisions of permits issued by those agencies for construction within their respective rights-of-way. Such permit requirements and provisions which are more restrictive than those specified herein, shall take precedence and supersede provisions of Contract Documents.
- E. Should contaminated soil be encountered, Contractor shall perform the following activities:

1. Promptly notify Owner's Representative contaminated or potentially contaminated soil has been encountered so Owner may identify party legally responsible for disposal of contaminated soil and properly direct Contractor how to proceed.
 2. Conduct work in contaminated areas in accordance with applicable OSHA and Cal OSHA regulations.
 3. Segregate and cover contaminated soils prior to removal from site.
 4. Dispose of contaminated soils as directed by Owner and as required by law.
- F. Should excavation be carried below lines and grades shown, refill excavated space to proper elevation with material as specified in Paragraph 2.2(D) above for correction of faulty grades after over-excavation.
- G. Trench excavation and backfill for pipelines, pipeline structures, box culverts, and conduits shall proceed as follows:
1. Alignment and grade for pipe shall be as shown. When flow line is shown, it shall be invert or interior bottom of pipe. When top of pipe is shown, it shall be exterior of pipe barrel. In absence of such profile grade, pipe shall be laid on straight grade to permit complete drainage and to provide at least 36" cover to finish ground or street subgrade unless otherwise shown.
 2. Where natural ground above pipeline trench has been over-excavated and/or pipeline is to be placed in new embankment, place and compact embankment material to elevation at least 12" above top of pipe prior to trench excavation.
 3. Except where specified otherwise in Contract Documents or permits or where documented acceptance is obtained from Owner's Representative; maximum length of open trench shall comply with Greenbook Section 306-3.5.
 4. Except where documented acceptance is obtained from Owner's Representative, maximum length of open trench in any location where concrete structures are cast in place shall be that necessary to permit uninterrupted progress. Pursue construction as follows:
 - a. Excavate
 - b. Set steel reinforcement
 - c. Place floor slab,
 - d. Place walls,
 - e. Place cover slab, roof or arch.
 - f. Allow concrete to cure.

g. Backfill

Each operation shall follow in sequence, and no operation shall precede the subsequent operation by more than 200'.

5. Failure of Contractor to comply with specified limitations may result in order to halt work until such time as compliance is achieved.
- H. Unless otherwise shown, minimum and maximum pipe trench width measured at top of pipe zone (12" above pipe crown) shall conform to Greenbook requirements (refer to Section 306-3). Maximum side clearance shall not exceed pipe nominal diameter.
- I. If maximum trench width is exceeded on either side of pipe, provide one of the following remedial measures at no additional cost to Owner.
1. Backfill trench with material specified for "Backfill for Over-Excavation" in Part 2 above to cradle pipe to spring line, or
 2. Modify bedding based on calculations accepted by Owner's Representative to accommodate wider trench width, or
 3. Substitute higher-strength pipe based on calculations accepted by Owner's Representative to accommodate wider trench width.
- J. Trench bottom preparation shall proceed as follows:
1. Grade trench bottom to provide smooth, firm, and stable foundation at every point throughout length of pipe. Transfer construction stake grades into trench as needed to ensure trench bottom is accurately graded. Place any special bedding required by Contract Documents.
 2. Prepare pipe subgrade at trench bottom for specific type of pipe material being installed in accordance with Specifications for said pipe.
 3. Should large gravel and cobbles be encountered at trench bottom or pipe subgrade, remove such items from beneath pipe and replace with granular material compacted to provide uniform support and a firm foundation.
 4. Whenever trench bottom does not afford a sufficiently solid and stable base to support pipe or appurtenances, excavate below normal trench bottom and replace it with crushed rock or gravel of sufficient thickness to form an unyielding foundation.
 5. If excessively wet, soft, spongy, unstable, or similarly unsuitable material is encountered at subgrade, remove unsuitable material and replace with crushed rock or gravel of sufficient thickness to form an unyielding foundation.
 6. Accurately shape pipe subgrade to fit pipe bottom using drag template or other suitable method. At each pipe joint, recess trench bottom to relieve pipe bells, couplings or flanges of all load.

7. Payment for removal of material and additional backfill required shall be in accordance with Contract Documents. However, if necessity for such additional bedding material has been occasioned by an act or failure to act on part of Contractor, Contractor shall bear expense of additional excavation and backfill to required depth.
8. Contractor's attention is called to their responsibilities in maintaining adequate dewatering procedures to ensure an otherwise stable foundation will not be rendered unfit due to water accumulation in trench.
9. Where rock is found, removed rock below grade and backfill trench with clean imported sand to provide a compacted foundation cushion with a minimum allowable thickness of 6" under outside diameter of pipe barrel and a clear space of 4" under pipe bell. Payment for removal of rock and additional backfill shall be in accordance with Contract Documents.

K. Backfill over pipe shall proceed as follows:

1. After pipe has been properly laid, exterior joints grouted and inspected, begin backfilling operations using material as specified above.
2. Contractor will be held responsible for any displacements of pipes or other structures, any damage to them or any instability caused by improper depositing of backfill material or improper use or handling of tools or equipment.
3. Backfill pipe located in public traveled right-of-way at end of each day's operations in accordance with applicable permit requirements. Remove spoil piles from traffic lanes by end of working day.
4. Mechanical densification or compaction of backfill shall use rolling, vibrating or impact means, or combination thereof. Method or methods used shall result in obtaining compaction of backfill in various specified zones and within maximum lifts specified. Densification or compaction method or methods used shall not damage pipe, adjacent ground, existing improvements, or improvements installed as part of Work.
5. Place material for mechanically compacted backfill in lifts which, prior to compaction, shall not exceed depths specified for various types of equipment.

TYPE OF COMPACTION EQUIPMENT	MAXIMUM LIFT DEPTH
Hand-directed mechanical tampers	≤ 6" in pipe zone, ≤ 8" elsewhere.
Impact, free-fall, or "stomping" equipment	≤ 36" (Do not use over concrete pipe, cement-mortar lined pipe or PVC.)
Vibratory equipment with smooth contact surface	≤ 24"
Rolling equipment, including, vibratory-interrupted surface equipment	≤ 12"

6. Contractor is advised water settling in pipe zone triggers requirement under AWWA C651 paragraph 5.1.2 to perform bacteriologic testing at 200' intervals

instead of 1200' intervals. Should Contractor elect to use water settling for potable water pipelines, Contractor shall perform additional disinfection required under AWWA C651 at no additional cost to Owner.

7. Water settling may be used in pipe zone and trench zone in lieu of mechanical compaction, only where material being backfilled is sufficiently sandy and permeable so specified compaction is achieved. Densification by saturation shall be accomplished by inserting a pipe, through which water is being supplied under pressure, to bottom of lift of material to be consolidated, and applying to each square yard or lesser surface area in this manner sufficient water to completely saturate overlying backfill and cause obvious settlement. Where water settling is used, exercise care to prevent pipe from floating. Do not use water settling in street zone.
 8. Contractor may use densification by saturation only when it has been determined it will not result in damage to adjacent ground, existing improvements or improvements installed for Work, and that it is appropriate to obtain specified compaction. Some encroachment permits limit methods of densification or compaction. In addition, use of densification by saturation is subject to all the following requirements.
 - a. Apply water in manner, quantity and rate sufficient to saturate thickness of lift being densified.
 - b. Vibrating compacting equipment may be necessary to supplement water saturation process where required densities cannot be attained by saturation alone.
 - c. Lift thickness of backfill shall not exceed that which can be readily densified by saturation procedure. In no case shall undensified lift exceed 5'.
 - d. Character of material excavated from trench may be generally, or in zones, unsuitable or densification with water. In this case, Contractor may, at no additional cost to Owner, import suitable material for saturation, or densify excavated material by mechanical compaction. If water does not readily drain from trench, it shall be removed by sump pump.
 9. Control of Trench Backfill by Zones: Whether mechanical compaction or densification by water saturation is employed, backfill shall be constructed by zones, and compaction requirement for each zone followed unless otherwise specified.
- L. Backfill in pipe zone shall occur as follows:
1. Hand-place backfill simultaneously on each side of pipe for full trench width, moistened as required to achieve specified compaction.
 2. In placing and compacting backfill, give particular attention to underside of pipe and fittings to provide firm support along full pipe length.
 3. Place warning and locator tape at distance above top of pipe specified above.

4. Take care in backfilling to avoid damage to pipe coating, locating tape and any conduits that may be installed in pipe zone. Complete pipe zone compaction before covering it with trench zone material.
- M. Backfill in trench zone shall use either mechanical compaction or water settling, depending on nature of material. Complete trench zone compaction before covering it with street zone material.
- N. Backfill in street zone shall occur as follows:
1. Backfill in traveled ways and public streets shall be in accordance with right-of-way agreement, encroachment permit or applicable regulations of agency having jurisdiction over traveled way. In absence of such provisions, compact soil by accepted hand-, pneumatic or mechanical-type tampers.
 2. Water consolidation will not be permitted.
 3. Construct pavement section in accordance with Contract Documents.

3.3 FIELD QUALITY CONTROL

- A. An Owner-approved soils-testing firm hired by Contractor shall provide continuous inspection of fill and will field test fill and earth backfill as placed and compacted, and inspect excavations and subgrade before concrete is placed and provide periodic inspection of open excavations, embankments, and other cuts or vertical surfaces of earth.
- B. Owner-approved soils-testing firm hired by Contractor shall provide laboratory results to Owner's Representative who will determine whether fills have been placed in accordance with Contract Documents.
- C. Whenever excavated material is not suitable for backfill, Contractor shall at their expense arrange for and furnish suitable imported backfill material which is capable of attaining specified relative density. Contractor shall also arrange for removal and off-site disposal of unsuitable excavated material at their own expense.
- D. Field testing of trenching and backfilling shall include:

ITEM	TEST FOR	TEST STANDARD (ASTM OR OTHER TEST STANDARD)	FREQUENCY	FIRST TEST PAID FOR BY	RETESTS PAID FOR BY
Backfill or Soil Prepared in Place	Sampling	ASTM D75	As directed	Contractor	Contractor
	Sieve Analysis	ASTM C136 or California Test Method 202	As directed	Contractor	Contractor
	Sand Equivalence	California Test Method 217	As directed	Contractor	Contractor
	Trench Width	Per Greenbook and Paragraph 3.2H above	As directed	Owner	Contractor
	Bedding Thickness	Depth specified in Part 2 above	As directed	Owner	Contractor

ITEM	TEST FOR	TEST STANDARD (ASTM OR OTHER TEST STANDARD)	FREQUENCY	FIRST TEST PAID FOR BY	RETESTS PAID FOR BY
	Rock Size in Backfill	Size specified in Part 2 above	As directed	Owner	Contractor
	Compaction (Laboratory Density Relations)	ASTM D1557 or California Test Method 216	As directed	Contractor	Contractor
	Field Density of Soil in Place	ASTM D1556 or ASTM D6938	As directed 300-foot maximum interval in trenches	Contractor	Contractor
	Field Density of Cohesionless Soils	ASTM D4253 and D4254	As directed	Contractor	Contractor
	11-Month Warranty Inspection	Demonstrate no visible pavement sags above pavement cut	1 inspection	Owner	Contractor
Cement-Sand Slurry	Slump (6" maximum)	ASTM C143	1 each batch	Owner	Contractor

- E. For testing purposes, percentages shall be determined by weight.
- F. Make all necessary excavations for compaction and other soils tests as directed by Owner's Representative.
- F. "Relative compaction" is ratio, expressed as percentage, of in-place dry density to laboratory maximum dry density.
- G. Compaction shall be deemed to comply with Contract Documents when no more than one of any 3 consecutive tests falls below specified relative compaction. Failing test shall be no more than 3 percentage points below specified compaction. Contractor shall pay costs of any retesting of Work not conforming to Contract Documents.
- G. Allow sufficient time for testing and evaluation of results before material is needed. Owner's Representative will be sole and final judge of suitability of all materials.
- H. Do not use materials in question pending test results.
- I. Contractor shall remove unsatisfactory material, re-compact, adjust moisture or compaction methods, place new material, and perform other operations necessary to meet Contract requirements as directed by Owner's Representative whose decisions and directions will be considered final on these matters.
- J. Owner's Representative will not provide and is not being paid to provide directions or submittal review regarding Contractor's excavation safety procedures. Any questions or concerns of Owner's Representative will be referred to Cal/OSHA whose decisions or directions shall be considered final.

3.9 ADJUSTING AND CLEANING

- A. Make necessary arrangements for and remove and dispose of all surplus excavated material off-site, unless otherwise provided for in Contract Documents. All costs for disposal of surplus waste material shall be borne by Contractor.
- B. Dispose of all surplus material not required for backfill or fill. Disposal shall occur outside limits of public rights-of-way and/or easements. Disposal shall comply with applicable ordinances and regulations of governmental agencies having jurisdiction and shall be done at no cost or liability to Owner.
- C. Do not deposit excavated material on private property unless written permission from property owner is secured by Contractor. Before Owner will accept Work as being completed, Contractor shall file written release signed by all property owners with whom they have entered into agreements for disposal of surplus excavated material absolving Owner from any liability connected therewith.
- D. Do not deposit excess material in water courses or other locations where disposed material will interfere with natural drainage.
- E. After backfill is completed, dress site smooth and leave site in neat and presentable condition, free of all cleared vegetation, rubbish and other construction wastes. Haul away and legally dispose of surplus rock or other excavated material which cannot be used for backfill. Areas next to structures where blade-type equipment cannot reach shall be hand raked.

** END OF SECTION **

**SECTION 32 12 16
ASPHALT CONCRETE PAVING**

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. The work of this section pertains to restoration of asphalt concrete paving that is within the lift station site (within its perimeter fencing), as well as restoration of asphalt concrete paving within the designated Materials and Equipment Storage Area; or within the Pedestrian Ramp Replacement area. Pavement damage to be restored shall be limited to damage caused by Contractor's work activities.
- B. Asphalt concrete shall conform to all requirements of Standard Specifications for Public Works Construction (SSPWC) and requirements herein.

1.2 RELATED WORK

- A. Section 01 30 00: Contractor Submittals
- B. Section 01 40 00: Quality Control
- C. Section 01 53 00: Protection of Existing Facilities
- D. Section 01 55 00: Site Access and Storage
- E. Section 01 60 00: Products, Materials, Equipment and Substitutions
- F. Section 02 41 14: Paving Removal and Resurfacing
- G. Section 31 05 16: Aggregate and Rock Products for Earthwork
- H. Section 31 23 33: Trenching and Backfilling

1.3 SYSTEM DESCRIPTION

- A. Furnish and install complete asphalt paving system including subgrade preparation, aggregate base, prime coat, asphalt concrete paving, seal coat, striping and all appurtenant Work.
- B. Completed asphalt paving system shall meet all permit requirements and requirements of city or agency having jurisdiction over paving and right-of-way.
- C. Where new pavement is placed over existing pavement, provide tack coat.

1.4 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workmen trained and experienced in necessary trades and crafts and completely familiar with specified requirements and methods for proper performance of Work of this section.
- B. Factory (batch plant) testing shall include the following:

ITEM	TEST FOR	TEST STANDARD (ASTM OR OTHER TEST STANDARD)	FREQUENCY	FIRST TEST PAID FOR BY	RETESTS PAID FOR BY
Crushed Aggregate Rock	Gradation	ASTM C136	Once prior to beginning work, Quarterly thereafter	Contractor	Contractor

ITEM	TEST FOR	TEST STANDARD (ASTM OR OTHER TEST STANDARD)	FREQUENCY	FIRST TEST PAID FOR BY	RETESTS PAID FOR BY
Liquid Asphalt	Asphalt Properties	SSPWC Table 203-2.4(A) for slow curing products	Once for each supplier and each type (grade) of liquid asphalt	Contractor	Contractor
Asphalt Concrete Mix	Uniformity of Distribution Binder	ASTM D2172	As directed	Contractor	Contractor

1.5 REFERENCES

- A. Asphalt Institute MS4 The Asphalt Handbook
- B. ASTM C136 Sieve Analysis of Fine and Course Aggregates
- C. ASTM D2041 Theoretical Maximum Specific Gravity and Density of Bituminous Paving Mixtures
- D. ASTM D2172 Quantitative Extraction of Bitumen for Bituminous Paving Mixtures
- E. ASTM D2950 Density of Bituminous Concrete in Place by Nuclear Methods
- F. SSPWC Standard Specifications for Public Works Construction (Greenbook) Section 200 "Rock Materials"
- G. SSPWC Standard Specifications for Public Works Construction (Greenbook) Section 203 "Bituminous Materials"
- H. SSPWC Standard Specifications for Public Works Construction (Greenbook) Section 302 "Roadway Surfacing"

1.6 SUBMITTALS

- A. Furnish the following submittals.

SUBMITTAL	DESCRIPTION	
Catalog Data	Required for all soil sterilants per catalog data requirements	
Certificate of Compliance	Submit report from testing laboratory certifying that aggregate material is asbestos-free and conforms to specified gradations or characteristics.	
Mix Design	Provide mix design in format consistent with requirements shown in SSPWC	
Rubber Blend Certification	Submit certification showing source of rubber materials and mix design	
Test Record Transcripts	Submit certified materials test reports for liquid asphalt and uniformity of distribution of binder per test record transcript requirements.	
Delivery Tickets	Required for all asphalt used.	
Warranty	Furnish one-year warranty from date of final acceptance	

- B. Refer to Section 01 30 00 for definition of requirements for catalog data, certificates of compliance and test record transcripts.

1.7 DELIVERY, STORAGE AND HANDLING

- A. Refer to contract documents for delivery, storage, and handling requirements.

- B. Manufacturer's instruction and warranty requirements for delivery, storage and handling of asphalt concrete and related products shall be strictly followed.

1.8 PAYMENT

- A. Payment for the Work in this section shall be included as part of the lump-sum for Bid Item No. 1.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Refer to Section 01 60 00 for basic requirements for products and materials.
- B. Bituminous products shall be constructed of the following materials.

ITEM	MATERIAL	SPECIFICATION
Aggregate Base Course	Crushed Aggregate Base	Conform to Section 200-2.2, crushed aggregate base of SSPWC
Prime Coat	Liquid Asphalt	Grade SC-250 as specified in SSPWC Section 302-5.3 Application rate: 0.25 gallons per square yard
Tack Coat (Required when paving over existing pavement)	Asphalt	PG 64-10 paving asphalt or SS-1h emulsified asphalt in accordance with SSPWC Section 302-5.4. Application rate: 0.10 gallons per square yard
Asphalt Concrete Pavement Base Course	Aggregate	¾-inch mineral aggregate conforming to SSPWC Section 203-6.3.2 using a Class B dense medium-coarse grading mixed with a bitumen content of 4.5% to 5.8% of the dry mineral aggregate weight. In small hand-rolled areas, a Class D1 or D2 fine grading may be substituted at the discretion of the Owner's Representative to improve workability.
	Bitumen	PG 64 -10 /paving asphalt per SSPWC Section 203-1
Asphalt Concrete Pavement Surface Course	Aggregate (Public-Right-of-Way)	½-inch mineral aggregate conforming to SSPWC Section 203-6.3.2 using a Class C2 / medium coarse grading mixed with a bitumen content of 4.6 % to 6.0% of the dry mineral aggregate.
	Bitumen	PG 64 -10 paving asphalt per SSPWC Section 203-1

- C. Asphalt concrete sand shall conform to the following gradation from Standard Specifications for Public Works (Greenbook) Table 200-1.5.54(A):

PERCENTAGE PASSING SIEVES BY WEIGHT	
SIEVE SIZE	ASPHALT CONCRETE SAND GRADATION
¾"	100%
No. 8	75-100%
No. 200	0-8%

- D. Asphalt concrete paving within public (City, County or State) rights-of-way, railroad rights-of-way, or on private property shall comply with permit requirements and other stipulations of applicable property owners.
- E. Install redwood header along all edges of asphalt concrete paving not otherwise abutting hardscape surfaces such as gutters, buildings, concrete pads, vaults,

asphalt concrete pavement, Portland cement concrete pavement, paved sidewalk, paved driveway approach, etc.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Scarify 6-inches below subgrade, bring to optimum moisture content, and compact to relative dry density of 90%.

3.2 INSTALLATION

- A. Products shall be furnished and installed by Contractor at locations shown on Plans and Submittals.
- B. The following installation standards shall be followed:
 - 1. Permit requirements of agencies having jurisdiction over streets.
 - 2. Applicable OSHA and Cal OSHA regulations
 - 3. Standard Specifications for Public Works Construction Section 302 "Roadway Surfacing"
- C. Refer variances between above documents and Contract Documents to Owner's Representative.
- D. Aggregate base material shall be furnished, placed and compacted for asphalt concrete pavements as shown. Spread and compact per SSPWC Section 301-2.
- E. Prime coat of liquid asphalt shall be pressure-spray applied as shown above after completing subgrade. If aggregate base is specified, apply prime coat after completing base course. Prevent liquid asphalt from spraying on adjacent ground, structures, curbing and fencing.
- F. Over existing pavement, a tack coat shall be applied in accordance with SSPWC Sec 302-5.3.
- G. Asphaltic concrete pavement shall be spread in one course by using Barber-Greene paving machine, or accepted equal. Spread to depth to achieve compacted thickness shown. Thoroughly compact completed surface smooth and true to grade and cross-section, and free from ruts, humps, depressions and irregularities.
- H. Apply seal coat of mixing type emulsion liquid asphalt to all asphaltic concrete pavements. Apply emulsion as shown above. Contractor shall have option of closing sealed area to traffic for at least 7-days or blotting with sand and sweeping with area being open to traffic as soon as cover material is laid.
- I. Adjust all valve box rings and covers to grade within 30 days after final paving of each street in which pipelines are installed.

3.3 FIELD QUALITY CONTROL

A. Field testing shall include the following:

ITEM	TEST FOR	TEST STANDARD (ASTM OR OTHER TEST STANDARD)	FREQUENCY	FIRST TEST PAID FOR BY	RETESTS PAID FOR BY
Subgrade	Compaction	Section 31 23 33	As directed	Owner	Contractor
Roadway/ Paving Base	Compaction	Section 31 23 33	As directed	Owner	Contractor
Asphalt Concrete	Compaction	95% per ASTM D2950	As directed	Owner	Contractor
Finished Pavement and Slurry Seal	Rolling	When straight edge is laid on finished surface parallel to centerline, surface shall vary <1/8-inch in 10-feet.	As directed	Owner	Contractor
	Drainage	Flood paved areas sufficiently to demonstrate absence of ponding and "bird-baths"	As directed	Owner	Contractor
	11-month Warranty Inspection	Demonstrate compliance to Contract Documents and Manufacturer's printed literature	1 test	Owner	Contractor

**** END OF SECTION ****

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**SECTION 32 35 16
ODOR FAN SOUND ENCLOSURE**

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Materials, testing, and installation of a sound enclosure for the fan that is mounted to the skid-mounted odor control system.

1.2 NOISE CONTROL SITUATION

- A. The odor control system fan is anticipated to create a noise level of 85 to 90 dba (radiated sound pressure measured at 2 feet from the noise source). The City of San Diego has indicated to Psomas that they will accept a maximum 65 dba measured at the nearest point to the property line. The odor fan will be located approximately 5 feet from the west property line of the lift station site. A sound enclosure shall be furnished and installed over the odor fan to reduce measured sound to 65 dba (maximum).
- B. Sound Enclosure manufacturer shall coordinate with odor control system manufacturer regarding fan type, fan model, fan dimensions, fan noise characteristics, and layout of the fan and odorous air piping on that skid-mounted unit. Sound Enclosure manufacturer shall design and fabricate an enclosure to install over this fan so that the property line noise limit is not exceeded. Contractor shall ensure the furnished noise enclosure fits the available space, and provides the required noise reduction.

1.2 RELATED WORK

- A. Section 01 30 00: Contractor Submittals
- B. Section 01 40 00: Quality Control
- C. Section 01 53 00: Protection of Existing Facilities
- D. Section 01 55 00: Site Access and Storage
- E. Section 01 60 00: Products, Materials, Equipment and Substitutions
- F. Section 09 90 00: Protective Coatings
- G. Section 44 31 00: Carbon Adsorber Odor Control System

1.3 SYSTEM DESCRIPTION

- A. Furnish and install complete a noise enclosure, including appurtenant structural, mechanical and connections, required for compliance with manufacturer's installation requirements and compliance with applicable building codes and standards. The enclosure shall house the odorous air fan, and shall allow air movement for fan motor cooling. Odorous air is conveyed to the fan by 10-inch diameter PVC pipe, and discharges into a carbon bed that is the treatment component of the odor treatment system. Treated air is discharged out of the top of the carbon bed enclosure. Control of the noise emanating from the carbon bed exhaust stack is NOT a requirement of this specification.

- B. The noise enclosure shall reduce odor fan noise to a maximum of 65 dba as measured at the pump station site's western fence line, at a point nearest the odor fan.

1.4 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workers trained and experienced in necessary trades and crafts and completely familiar with specified requirements and methods for proper performance of Work of this section.

1.5 REFERENCES

- A. ASTM A164 Electrodeposited Coatings of Zinc on Steel
- B. ASTM A307 Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength
- C. ASTM A653 Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by Hot-Dip Process
- D. ASTM B633 Electrodeposited Coatings of Zinc on Iron and Steel
- E. ASTM C423 Sound Absorption and Sound Absorption Coefficients by Reverberation Room Method
- F. ASTM E84 Surface Burning Characteristics of Building Materials
- G. ASTM E136 Behavior of Materials in a Vertical Tube Furnace at 750°C
- H. Fed Spec HH-1-558B Insulation Blocks, Boards, Blankets, Felts, Sleeving (Pipe and Tube Covering), and Pipe Fitting Covering, Thermal (Mineral Fiber, Industrial Type)

1.6 SUBMITTALS

- A. Furnish the following submittals.

SUBMITTAL	DESCRIPTION	
Shop Drawings	Required per equipment shop drawing requirements.	
Catalog Data	Required per catalog data requirements.	
Installation Instructions	Required per installation or application instruction requirements.	
O & M Instructions	Required per operation and maintenance instruction requirements	
Engineering Calculations	Required for vibration isolators per engineering calculations requirements.	
Material Samples	Required for acoustic panels on Owner's request	
Warranty	Furnish one-year warranty from date of final acceptance.	

- B. Refer to Section 01 30 00 for definition of requirements for shop drawings, catalog data, installation instructions, O&M instructions, engineering calculations, and material samples.

1.7 DELIVERY, STORAGE AND HANDLING

- A. Refer to contract documents for delivery, storage, and handling requirements.
- B. Manufacturer's instruction and warranty requirements for delivery, storage and handling of sound barriers shall be strictly followed.

1.8 PAYMENT

- A. Payment for the Work in this section shall be included as part of the lump-sum for Bid Item No. 1.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Acceptable manufacturers include:

ITEM	MANUFACTURER	MANUFACTURER LOCATION
Sound Enclosure for odor control fan (mounted to odor control system skid)	Mfr: Price Industries, Inc. Local rep is Norman S. Wright Climatec (Lakeside, CA; contact Kyle Bond; 619.606.1555)	Suwanee, Georgia
	Mfr: Kinetics Noise Control, Inc. Local rep is Kinetics Resource and Application Group (Anaheim, CA; contact Jeff Hanzel; 714.235.3511)	Dublin, Ohio
	Accepted equal	

2.2 MATERIALS

- A. Refer to Section 01 60 00 for basic requirements for products and materials.
- B. Sound barriers shall be constructed of the following materials (or manufacturer-recommended equivalent materials):

1. Typical Materials of Construction

ITEM	MATERIAL	SPECIFICATION
Bolts and Nuts	Galvanized Steel	ASTM A307 Galvanized per ASTM B633
Sound Absorptive Panels	Sheet steel	ASTM A653 Class G90 12" Panel Width 3/4" thick
Face Panel	Sheet steel	ASTM A653 Class G90 22-gauge minimum Perforated per manufacturer's recommendations
Back Tray	Sheet steel	ASTM A653 Class G90 16-gauge
Sound Absorbing Batt	Mineral rock wool	Fed Spec HH-1-558B and ASTM E136 1/2" setback from perforated panels 2" minimum thickness 6 ppf density Absorb < 1% water Noncorrosive Melting temperature above 2000°F Flame spread of 15 or less per ASTM E84 Incombustible per ASTM E136 Non-hygroscopic

ITEM	MATERIAL	SPECIFICATION
		NRC of 1.05 STC of 35
Coating	Polyurethane	3-mil polyurethane powder coating Color selected by Owner

2. The materials listed above are not intended to limit the manufacturer's ability to use materials that are common to his noise enclosure design. Contractor shall use materials that are suitable for this application to achieve the required noise reduction. Furnished materials shall be weather-resistant (against rain, wind and UV degradation). The enclosure design shall accommodate fan motor cooling, and shall incorporate easily-removable panels to facilitate access to the fan for maintenance purposes.

C. The following product design criteria, options and accessories are required:

ITEM	DESCRIPTION
Sound Absorbing Panels	Minimum Noise Reduction Coefficient (NRC) of 1.10 per ASTM C423

D. The noise enclosure shall be painted white to match the color of the odor control system.

PART 3 - EXECUTION

3.1 PREPARATION

A. Make field measurements needed to install sound barriers before submitting shop drawings or ordering. Make minor changes in dimensions and alignments as needed to avoid utilities or structural conflicts.

3.2 INSTALLATION

A. Furnish and install sound barriers at locations shown on Plans and Submittals.

B. The following installation standards shall be followed:

1. Manufacturer's installation and warranty requirements
2. Applicable OSHA and Cal OSHA regulations
3. Applicable building and fire code requirements

C. Refer variances between above documents and Contract Documents to Owner's Representative.

D. Flexible connectors shall be installed at points of attachment of piping or conduit to mechanical equipment. Flexible connectors shall be as close to mechanical equipment as possible and shall be installed on pipes parallel to equipment shafts.

3.3 FIELD QUALITY CONTROL

A. Field testing shall include:

ITEM	TEST FOR	TEST STANDARD (ASTM OR OTHER TEST STANDARD)	FREQUENCY	FIRST TEST PAID FOR BY	RETESTS PAID FOR BY
Vibration Isolators	Noise	See standards under individual equipment items	1 test each item	Contractor	Contractor
Sound Barriers and Vibration Isolators	Field Performance	Demonstrate compliance to Contract Documents and Manufacturer's printed literature	1 test	Contractor	Contractor
	11-Month Warranty Inspection	Demonstrate compliance to Contract Documents and Manufacturer's printed literature	1 test	Owner	Contractor

B. Provide services of factory authorized representative on-site as needed to provide:

1. Installation assistance, inspection and startup of complete system.
2. Field testing and adjustment.

**** END OF SECTION ****

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**SECTION 32 90 00
RESTORATION OF EXISTING LANDSCAPING**

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Materials, testing, and installation of landscaping.
- B. This specification section provides minimum guidelines for restoration of existing landscaping that is damaged by Contractor's work. The type, density, maturity and appearance of the replacement landscaping vegetation shall be similar to what existed prior to the Contractor's work.
- C. Restoration of landscaping includes restoration of planted vegetation, trees, shrubs, etc, as well as existing irrigation system components (piping, automatic valves/controllers, spray heads, etc.). The layout and function of the restored irrigation system shall be equal to that of the existing system prior to the Contractor's work.
- D. Contractor shall be responsible to maintain replanted vegetation and to monitor the performance of the restored irrigation system, for a period of time deemed appropriate by the City of San Diego. This warranty period shall not exceed the warranty period of the construction contract.

1.2 STANDARD SPECIFICATIONS

- A. Except as otherwise indicated in this Section of the Specifications, the Contractor shall comply with the 2015 edition of the Standard Specifications for Public Works Construction (SSPWC; Greenbook), and the 2015 edition of the City of San Diego Whitebook. Landscape and irrigation requirements are specifically addressed in Part 8 of those two documents.

1.3 RELATED WORK (TECHNICAL SPECIFICATIONS)

- A. Section 01 30 00: Contractor Submittals
- B. Section 01 40 00: Quality Control
- C. Section 01 53 00: Protection of Existing Facilities
- D. Section 01 55 00: Site Access and Storage
- E. Section 01 60 00: Products, Materials, Equipment and Substitutions
- F. Section 31 23 33: Trenching and Backfilling

1.3 SYSTEM DESCRIPTION

- A. Furnish and install complete landscaping, including labor, materials and equipment to cultivate planting areas, furnish and install soil amendments, furnish and install fertilizers and conditioners, prepare and install special soil mixes, and furnish and install plant materials and protect plant materials through specified maintenance period.

1.4 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workers trained and experienced in necessary trades and crafts and completely familiar with specified requirements and methods for proper performance of Work of this section.
- B. Owner reserves right to reject Contractor's submitted soil if it will require amending not covered under original contract.
- C. Owner reserves right to take and analyze samples of materials for conformity to specifications at any time. Furnish samples upon request by Owner's Representative.
- D. Owner's Representative reserves right to inspect plant materials at nursery or growing ground prior to loading and transporting. If Owner elects to inspect at nursery, tag all trees and representative samples of shrubs and ground cover prior to inspection and arrange with Owner's Representative 10 days in advance for inspection.
- E. Acceptances of plant materials at nursery shall not impair Owner's right of inspection and rejection during progress of Work
- F. Immediately remove rejected materials from site, at Contractor's expense. Cost of testing of materials not meeting specifications shall be paid by Contractor.

1.5 REFERENCES

- A. ANLA/ANSI Z60.1 Nursery Stock
- B. California Building Code (CBC)
- C. Hortus Third "Plant Nomenclature"

1.6 SUBMITTALS

- A. Furnish the following submittals.

SUBMITTAL	DESCRIPTION	
Plant List	Submit within 30 days after Notice to Proceed complete list of plant materials to be furnished under this Section and confirmed sources for same. Owner reserves right to accept or reject suppliers and subcontractors.	
Catalog Data on Amendments	Furnish Manufacturer's laboratory analytical data for: <ul style="list-style-type: none"> • Organic soil amendment • Commercial fertilizers • Chemical additives 	
Certificate of Compliance	Certify strict compliance with accepted soil mixes and amendments including rates for application.	
Material Samples	Deliver 3 representative samples of each size of tree and shrub species to project site for Owner's review and acceptance prior to ordering remaining plants. Maintain accepted samples in good condition at Contractor's yard during construction period, and install as last plants on project. Replace rejected plants immediately with acceptable samples. All plants delivered to project shall meet standards of these representative samples.	
Delivery Tickets	When bulk materials are delivered, submit Bill of Lading for each delivery.	
Test Pit Drainage Results	See Section 3 below	

SUBMITTAL	DESCRIPTION	
Warranty	Furnish one-year warranty from date of final acceptance	

- B. Refer to Section 01 30 00 for definition of requirements for catalog data, certificates of compliance, and material samples.

1.7 DELIVERY, STORAGE AND HANDLING

- A. Refer to contract documents for delivery, storage, and handling requirements.
- B. Deliver products in Manufacturer's standard packaging. Transport organic amendments directly from source to staging area and stockpile as directed by Owner.
- C. Store products to protect them from damage and contamination, and comply with Manufacturer's storage instructions.
- D. Transport plant materials in enclosed or tarped vehicles to minimize damage from wind and sun. Carefully schedule and monitor shipments to minimize shipping time and ensure careful handling of plants.
- E. Shipments of plants will be inspected by Owner's Representative at time of off-loading trucks to verify compliance with shipping requirements.
- F. Trucks and vehicles shall not be permitted to pass over curbs, paving, etc., unless paving is protected against damage. Do not move equipment over existing or newly placed structures without acceptance by Owner's Representative.
- G. Provide board-roading as required to protect paving and turf areas. Protect other improvements from damage with protection boards, ramps and protective sheeting.
- H. Deliver container-grown plants in container sufficiently rigid to hold ball shape and protect root mass.
- I. At Contractor's option, spray evergreen plants and deciduous plants in full leaf with anti-desiccant immediately prior to shipment.
- J. Notify Owner's Representative at least 2 weeks prior to shipping to allow for pre-delivery inspection of plant material at nursery.
- K. Deliver packaged material in sealed containers showing weight, analysis, and name of Manufacturer. Protect materials from deterioration during delivery and while stored at site.
- L. Deliver only plant materials that can be planted in one day unless adequate storage and watering facilities are available on site.
- M. Protect plant material during shipping by proper handling techniques. Cracked or crumbling root-balls will be rejected. Protect at site by maintaining thoroughly moist root-ball. Maintain root-ball in moist condition and do not allow to dry out.

- N. Notify Owner's Representative of delivery schedule at least 48 hours in advance so plant material can be inspected prior to unloading from trucks.
- O. Remove rejected material immediately from site.
- P. Do not lift, move, adjust to plumb, or otherwise manipulate plants by trunk or stems.

1.8 PAYMENT

- A. Payment for Work in this section shall be included as part of the lump-sum for Bid Item No. 1.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

- A. Replacement of Damaged Landscaping Vegetation: Contractor shall replace vegetation that is damaged by his/her construction activities, with vegetation of like type and of similar size and quality
- B. Replacement of Damaged Irrigation System Components: Contractor shall replace irrigation system components (piping, control valves, wiring, etc.) that is damaged by his/her construction activities, with irrigation system components of like type and of similar size and quality.
- C. Replacement of damaged landscaping or irrigation system components will not be required if removal without replacement or restoration is specifically indicated on the Drawings or as may be specified elsewhere in these contract documents.

2.2 MATERIAL REQUIREMENTS

- A. Products used for replacement and/or restoration of existing landscaping and irrigation system components or features, shall comply with the Greenbook and Whitebook, and other applicable specification sections of these contract documents.

PART 3 - EXECUTION

3.1 GENERAL REQUIREMENTS

- A. Installation of landscaping and irrigation system components shall comply with the Greenbook and Whitebook, and other applicable specification sections of these contract documents.

** END OF SECTION **

**SECTION 33 01 30
SEWAGE BYPASSING**

PART 1 - GENERAL

1.1 WORK INCLUDED AND CONTRACTOR RESPONSIBILITIES

- A. Bypass pumping is necessary so that certain portions of the Work of this contract can be constructed without causing a sewage overflow.
- B. Contractor is required to furnish all materials, labor, equipment, power, maintenance, etc. to implement a temporary pumping system for the purpose of stopping flow from discharging into the Sewage Pump Station 23T wetwell, and using temporary pumps to convey that flow to the existing 16-inch diameter forcemain. This system shall conform to the general requirements of Greenbook Section 7-8.5, as well as the detailed requirements and site specific information provided in this specification section.
- C. Contractor shall design a bypass plan to accomplish the work of this contract, to accommodate the site constraints and the requirement to maintain sewage pumping at all times without causing a spill. The means and method for achieving this goal are entirely the Contractor's responsibility. A general method to accomplish this bypass is described in this specification section (and is referred to on the contract drawings). However, **it is strictly and entirely the Contractor's responsibility to devise and implement an appropriate and effective bypass pumping method, which may or may not conform to the specific (named) equipment and equipment layout described herein.**
- D. Prior to implementing a pumped bypass, Contractor shall submit to the City for review and acceptance, a detailed bypass plan and profile that illustrate the layout of the primary and standby pumps and all associated appurtenances (electrical, control, piping, valving, fittings, etc.) to show how this equipment will fit within the available space at the lift station site. This submittal shall also include information that defines pump performance for the anticipated range of pump operating speeds versus the theoretical system curve (this curve shall be determined by the Contractor). The piping layout drawing shall indicate approximate locations for temporary piping, shutoff valves, check valves, pipe fittings, and connection to the permanent bypass pump connection.

1.2 BASIC REQUIREMENTS

- A. Basic Performance Requirements:
 - 1. The bypass pumping system shall have sufficient capacity to pump the peak flow rate that is conveyed to the Influent Manhole by the upstream gravity sewer collection system. The Contractor shall provide all pipeline plugs, pumps of adequate size to handle peak flow, and temporary discharge piping to ensure that the total flow of the influent sewer is safely diverted around lift station when it is out of service for modification per this contract. Bypass pumping system will be required to operate 24 hours per day.

2. The furnished Bypass System must overcome force main pressure on discharge, at all required pumping rates.
- C. Bypass Pumping Company: The Contractor shall employ the services of a vendor who can demonstrate to the Engineer that they specialize in the design and operation of temporary bypass pumping systems. The vendor shall provide at least three (3) references of projects of a similar size and complexity as this project performed by that firm within the past five years. The bypass system shall meet the requirements of all codes and regulatory agencies having jurisdiction

1.3 CONSTRUCTION OF PERMANENT BYPASS PUMPING CONNECTION (BEFORE BYPASS PUMPING CAN COMMENCE)

- A. This contract requires construction of new permanent bypass pump piping before a bypass pumping system can be implemented. Contractor is advised that the existing buried 16-inch diameter plug valve that is on the forcemain immediately outside the pump room is defective and cannot be closed. Thus, the forcemain shall be emptied to allow construction of the new bypass piping system. A "potential" procedure to implement that work is described below:
- Step #1: Contractor shall obtain and review documents that provide information pertinent to existing facilities. At a minimum such documents shall include the following:
 - Reference drawings that describe the existing lift station, and forcemain.
 - The City's emergency overflow plan for this lift station. This document indicates theoretical detention times that can occur prior to sewer overflow for the upstream collection system at various inflow rates.
 - Step #2: Furnish and install a pneumatic plug in the 30-inch diameter influent sewer to prevent inflow from the collection system from emptying into the wetwell during construction of the new bypass pump piping system.
 - Step #3: Contractor shall coordinate with City staff to pump down the wetwell to create a sufficient storage volume within the wetwell to receive all of the sewage that is drained from the forcemain.
 - Step #4: Empty the existing 16-inch diameter PVC forcemain from its first highpoint to the lift station, to allow modification of the yard piping per the contract drawings. Contractor shall determine the forcemain volume to be drained. As-built drawings indicate the approximate length of that portion of the forcemain is 2,180 LF. Psomas anticipates the wetwell water levels can be managed to allow the forcemain to be drained back without increasing water level in the wetwell to the level of the pump room floor.

Caution: Contractor shall not allow a hydraulic surcharge of the pump room floor for any reason. Such surcharge (from water pressure against the bottom of the floor slab) could cause structural damage to the floor; and/or it could cause dislodgement of the two existing sewer manhole covers that provide access to the wetwell from the Pump Room. Dislodgement of the sewer manhole covers would at the minimum saturate the Pump Room atmosphere with sewage gases which is hazardous, but could also flood the Pump Room with sewage.

- Step #5: Remove designated yard pipe and fittings as required for installation of the new permanent bypass pumping piping.
 - Step #6: Install new permanent bypass pumping piping, valves, fittings, connection vault, and all appurtenances. Contractor shall have onsite, all materials needed to install this new piping, and shall pre-assemble as much of this piping as possible prior to taking the lift station out of service (i.e. Step #2).
- B. Contractor shall plan this work to occur during a low flow period to maximize the time that is available to implement this work without causing a sewer overflow.
- C. Contractor shall control the rate at which the forcemain is drained back to avoid damaging the forcemain, forcemain appurtenances, yard piping, or piping inside the pump room, due to creation of a vacuum.
- D. Contractor may propose an alternative construction procedure; and shall submit a detailed description of his/her proposed plan per Paragraph 1.1D above.
- E. Contractor shall obtain Owner's review and approval prior to implementing his proposed bypass scheme (and related construction sequence).

1.4 A BYPASS PUMPING SYSTEM CONCEPT

- A. General: This contract requires bypass pumping operations to allow the wetwell to be taken out of service for replacement of suction piping (that is within the wetwell) for Pumps #1 and #2, as well as replacement of the influent sewer sluice gate. At Contractor's option, the Bypass pumping requirements may be as generally described herein. Contractor is NOT required to implement the exact bypass pumping scheme that is described herein. **It is Contractor's responsibility to devise a workable bypass pumping method that will successfully allow construction to occur without causing sewage overflow when the existing pump station is taken out of service for modifications.**
- A. Furnish and install a motor-driven submersible bypass pump to function as the primary bypass pump. This pump could be located in the Influent Manhole that is located within the lift station site. The capacity of this pump should be at least 1,500 gpm at 90 feet TDH. Contractor shall provide all appurtenances required for installation and operation of this pump including (but not limited to) the following:
- Temporary power to the submersible bypass pump (per the electrical drawings).
 - A portable VFD to control submersible pump operating speed.
 - Power and control cables between the VFD and submersible pump.
- B. The portable VFD could be located near the western fence line in the area that is designated for installation of the new odor control system. Bypass pumping will occur prior to installing the odor control system. Alternatively, the VFD could be installed near the existing MCC from which its utility power will come.

Psomas anticipates Contractor will allow the sewage level to increase in this manhole as required for proper pump operation and control, without causing an

overflow anywhere within the upstream sewer system.

- C. Furnish a diesel engine-driven suction lift pump (trailer-mounted or skid-mounted) to function as a backup to the primary bypass pump. The capacity of this pump shall be 2,000 gpm at 107 feet TDH (which matches the design capacity of the permanent pumps inside the pump room). This pump shall take suction from the influent manhole.
- D. Psomas anticipates Contractor will allow the sewage level to increase in this manhole as required to reduce suction lift requirements to the furnished pump's design capability, and as required for proper pump operation and control. Contractor shall not cause an overflow anywhere within the upstream sewer system.
- E. Contractor shall furnish and install a temporary level sensing system in the Influent Manhole to control operation of the primary and secondary bypass pumps. Contractor shall furnish and install temporary power and control wiring to both bypass pumps as needed for their operational control, and shall also provide alarms to indicate high water level, pump failure and other parameters that are important to monitoring system status.
- F. Contractor shall furnish temporary piping, shutoff valves, check valves, air release valves, pipe fittings, couplings and all other appurtenances that are needed to implement the required bypass pumping system. The design drawings do not show these appurtenances; but they shall be furnished by Contractor at no additional cost to Owner.
- G. Both bypass pumps shall discharge to the permanent bypass pump connection that shall be constructed prior to implementation of bypass pumping.
- H. Contractor will not be required to provide personnel to observe bypass pumping system operation on a 24/7 basis. However, Contractor shall provide alarms and an automatic calling system to alert both Contractor and City staff to an emergency condition when contractor personnel are not onsite. The automatic calling system shall include connection to the lift station's SCADA system for remote indication of bypass pumping system status. An emergency contact phone list shall be clearly posted on the bypass equipment. When onsite, Contractor personnel shall have access to telephone communication to allow immediate response in the event of a bypass pumping system malfunction.

1.5 GENERAL BYPASS PUMPING REQUIREMENTS

- A. The bypass pumping system shall be pressure rated for a minimum of 150 psi. All joints on bypass piping shall be self-restraining. The bypass pumping system shall be pressure tested according to Standard Specifications for Public Works Construction (Green Book).
- B. The SPS 23T lift station bypass pumping system shall be operated without failure for a continuous two (2) day period prior to taking this lift station out of service. Contractor shall measure and record (for submission to the City) key operational performance indicators such as pump operating speed, pumping pressure, pumping rate, water level in the Influent Manhole, and noise level (DBA). The

Primary and Backup bypass pumps shall both be performance tested during this period.

- C. Piping connections for bypass pumping systems (on suction side or discharge side) shall be configured as required to avoid release of odors.

1.6 CONTRACTOR RESPONSIBILITIES SHOULD A SEWAGE SPILL OCCUR

- A. Contractor shall be responsible to immediately inform the City of any spills caused by his construction activities, and shall be responsible to immediately repair and remedy the spill and all resulting damage.
- B. Any and all spills occurring as a result of the Contractor's work, including financial responsibility for any fines imposed on the City as a result of a spill caused by the Contractor (either as a direct result of his work or by failure of the furnished bypass pumping system) shall be the responsibility of the Contractor.

1.7 INFORMATION REGARDING SEWAGE INFLOW RATES TO SPS 23T

- A. The City's flow records for SPS 23T indicate the following inflow rates to this lift station:
 - March 1 through 31, 2015:
 - Minimum Daily Inflow Rate: 99.9 gpm to 265.2 gpm
 - Maximum Daily Inflow Rate: 627.7 gpm to 1,273 gpm
 - August 1 through 31, 2015:
 - Minimum Daily Inflow Rate: 7.9 gpm to 194.5 gpm
 - Maximum Daily Inflow Rate: 524.5 gpm to 1,221 gpm
 - September 1 through 30, 2015:
 - Minimum Daily Inflow Rate: 8.9 gpm to 199.9 gpm
 - Maximum Daily Inflow Rate: 543.6 gpm to 1,333 gpm
 - January 1 through 8, 2016 (note: heavy rainfall occurred January 5 to 7):
 - Minimum Daily Inflow Rate: 35.02 gpm to 316.2 gpm
 - Maximum Daily Inflow Rate: 281.3 gpm to 1,139 gpm

1.8 INFORMATION REGARDING THE CITY'S EMERGENCY RESPONSE PLAN FOR SPS 23T

- A. The City's "Emergency Response Plan" for SPS 23T provides information regarding typical sewage inflow rates, as well as information concerning the theoretical storage volume (and detention times as defined inflow rates) for temporary (and short-term) storage of inflow within the upstream gravity sewer collection system. Key information from that report is summarized herein.
- B. At a Typical Low Inflow Rate of 100 gpm, there is approximately 44.65 hours of detention time within the upstream sewer system before overflow occurs at the lowest upstream manhole.

- C. At a Typical Average Inflow Rate of 310 gpm, there is approximately 14.40 hours of detention time within the upstream sewer system before overflow occurs at the lowest upstream manhole.
- D. At a Typical Peak Inflow Rate of 800 gpm, there is approximately 5.58 hours of detention time within the upstream sewer system before overflow occurs at the lowest upstream manhole.

1.9 BYPASS PUMPING PLAN

- A. The Contractor shall prepare with his selected bypass pumping vendor/subcontractor a specific, detailed description of the proposed pumping system.
- B. The Contractor shall submit to the Engineer detailed plans and descriptions outlining all provisions and precautions to be taken by the Contractor regarding the handling of existing wastewater flows. This plan must be specific and complete, including such items as schedules, locations, elevations, capacities of equipment, materials and all other incidental items necessary and/or required to ensure proper protection of the facilities, including protection of the access and bypass pumping locations from damage due to the discharge flows, and compliance with the requirements and permit conditions specified in these Contract Documents. No construction requiring a sewer bypass shall begin until all provisions and requirements have been reviewed by the Engineer.

1.10 BYPASS PUMPING PLAN

- A. The plan shall include, but not be limited to, details of the following:
 1. Sewer plugging method and types of plugs.
 2. Number, size, material, location and method of installation of temporary suction piping.
 3. Number, size, material, method of installation and location of temporary discharge piping.
 4. Bypass pump sizes, capacity, number of each size of pump that is to be on-site, and power requirements.
 5. Standby power generator size, and location.
 6. Downstream discharge plan.
 7. Thrust blocks and/or other thrust restraint devices; sizes, types and locations.
 8. Sections showing suction and discharge pipe depth, embedment, select fill and special backfill.
 9. Method of noise control for each pump and/or generator.
 10. Temporary pipe supports (if required) and anchoring.
 11. Drawings that show the layout of, and access to, the bypass pumps and major appurtenances that are furnished for this project.
 12. Calculations for selection of bypass pumps and bypass pumping pipe sizes.
 13. Schedule for installation of, and maintenance of, bypass pumping lines.

1.11 RELATED WORK

- A. Section 01 30 00: Contractor Submittals
- B. Section 01 40 00: Quality Control
- C. Section 01 53 00: Protection of Existing Facilities

- D. Section 01 55 00: Site Access and Storage
- E. Section 01 60 00: Products, Materials, Equipment and Substitutions

1.12 CONTRACTOR'S RESPONSIBILITIES

- A. Provide labor, materials and supervision to temporarily bypass flow around Work.
- B. Notify Owner's Representative before bypassing sewage flow.
- C. Notify customers whose service will be disrupted in writing before bypassing sewer service.
- D. Entire bypassing system shall be in place and tested before bypassing any sewage.
- E. Notify Owner's Representative immediately in event of sewage spill.

1.13 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workmen trained and experienced in necessary trades and crafts and completely familiar with specified requirements and methods for proper performance of Work of this section.
- B. Provide pumps, conduits, and other equipment to bypass sewage flow. Furnish necessary labor and supervision to set up, maintain and operate pumping and bypass system.
- C. Trailer-mounted diesel engine driven pumps shall be equipped with a muffler and shall be enclosed to keep noise level below 60db (measured 30 feet from the pump enclosure), or 10db above ambient noise levels when measured at property lines closest to the bypass pump.
- D. Electric motor-driven submersible pumps shall comply with the same noise requirements as for a diesel engine-driven pump. Pumps and bypass lines shall be of adequate capacity and size to handle flows.
- E. Maintain on-site sufficient equipment and materials to ensure continuous and successful operation of bypass system. Standby pumps shall be fueled and operational at all times. Maintain on site sufficient valves, tees, elbows, connections, tools, sewer plugs, piping, and other parts or system hardware to ensure immediate repair or modification of any part of system.
- F. Design all piping, joints and accessories to withstand at least twice maximum system pressure, or 150 psi, whichever is greater.
- G. Do not discharge sewage to ground surface, receiving waters, storm drains, or locations which may result in groundwater contamination or potential health hazards.
- H. Do not shut down the bypassing system without written permission from Owner's Representative. Do not remove bypass without informing Owner's Representative.

1.14 REFERENCES

- A. California Building Code (CBC)
- B. California Electrical Code (CEC)
- C. California Fire Code (CFC)
- D. California Plumbing Code (CPC)
- E. 2015 Greenbook
- F. 2015 Whitebook

1.15 SUBMITTALS

- A. Furnish the following submittals.

SUBMITTAL	DESCRIPTION	
Shop Drawings	Sewer Bypass Pumping Plan	
	Show location of temporary sewer plugs diversion points and bypass discharge lines.	
	Show expected high water level behind plugs and diversions.	
	Show capacities of pumps, prime movers and standby equipment.	
	Show standby power source.	
	Show materials proposed for temporary surfacing over bypass pipes.	
	Show materials proposed for permanent surface replacement over bypass pipe trenches.	
	Show methods for security and protection of bypass system.	
Description of Proposed Equipment	Show suction and discharge pipe diameters, materials and bury depths	
	Show size and model of pumps including pump curve, horsepower, speed, voltage and phase or fuel type and fuel consumption as applicable.	
	Show make, model, horsepower, kW and kVA ratings, speed, voltage, phase, fuel type and fuel consumption of standby generator if used.	
	Show standby equipment provided on-site in case of emergency.	
Staffing Plan and Schedule	Provide staffing plan for maintaining equipment for 24-hour continuous reliable operation including weekends and holidays.	
	Show anticipated times of flow interruption and/or flow diversion	
Spill Contingency Plan	Detail precautions to be implemented to prevent sewage spills, including specific responses and control measures to follow during overflow resulting from breakage or blockage and maintenance and inspection schedules to detect potential problems and mitigate potential release resulting from overflows, bypass pipe ruptures, pipe ruptures, blockages and backups.	
Warranty	If water levels are raised more than 18 inches above sewer soffit at any point in upstream sewer, provide statement accepting full responsibility and liability for damage to upstream properties due to backflow during bypassing.	

- B. Refer to Section 01 30 00 for definition of requirements for shop drawings.

1.16 PAYMENT

- A. Payment for Work in this section shall be included as part of the lump-sum for Bid Item No. 1.

PART 2 - PRODUCTS

2.1 BYPASS PUMPING CONCEPT (DEVELOPED DURING DESIGN PHASE EVALUATIONS AS A POSSIBLE BYPASS PUMPING METHOD)

- B. The detailed information provided below for the possible use of a submersible motor-driven bypass pump plus a trailer-mounted diesel engine-driven bypass pump pertain to a bypass pumping scheme that Contractor could consider as a possible method to implement the required bypass pumping.
- C. The electrical design drawings reflect power and control features that would be necessary to implement the bypass pumping system described herein. Contractor is responsible to determine how best to achieve the bypass pumping goals, and shall furnish and install electrical power and control features as needed for the bypass pumping system that Contractor proposes (subject to City review and approval).
- D. **Contractor is NOT required to implement the exact bypass pumping scheme that is described herein. It is Contractor's responsibility to devise a workable bypass pumping method that will successfully allow construction to occur without causing sewage overflow when the existing pump station is taken out of service for modifications.**

2.1.1 SUBMERSIBLE SEWAGE PUMP (PRIMARY BYPASS PUMP) AND PORTABLE VFD

- A. The Primary Bypass Pump could be submersible sewage type and could be installed in the Influent Manhole. The intended bypass pumping concept is that this pump will operate all the time (without regular alternation between the Primary pump and Backup pump); with the Backup pump only operating when the Primary pump fails or is otherwise unable to match the sewage inflow rate. This pump would discharge to the newly-constructed permanent bypass pumping connection. Pump shall be able to pass, without clogging, sewage solids that are commonly found in municipal sewage.
- B. The Primary Bypass Pump could have the following operating characteristics (at full speed):
 - Shutoff Head: 204 feet
 - Rated Performance: 1,600 gpm at 120 feet (drawing 70 hp at this performance point)
 - Maximum Performance: 2,000 gpm at 100 feet.
 - Allowable Operating Range: 350 gpm to 2,000 gpm (at full speed).
- C. The pump vendor shall also furnish a portable variable frequency drive (VFD) to control the operating speed of the submersible pump. It is intended that pump operating speed will vary to the maximum extent feasible, to match the sewage inflow rate to the Influent Manhole. When the sewage inflow rate decreases below the pump's minimum discharge capacity, this pump will be controlled to operate as a constant speed pump (at minimum recommended RPM); cycling ON and OFF to maintain the water level in the Influent Manhole within a predetermined depth range (substantially below overflow level). Contract Drawing E-6 defines Phase 1 of electrical improvements which pertains to providing power and control to this temporary submersible sewage pump. Contract Drawing E-9 defines Phase 4 of electrical

improvements which pertains to removing the power and controls that were provided for this temporary submersible sewage pump.

- D. Contractor shall furnish and install all appurtenances and accessories, including power lines and control devices that are required for a complete, functioning pumping system.
- E. It is intended that the submersible pump would fit through the existing 36-inch diameter manhole cover opening, without need to remove any of the manhole sections. Contractor shall furnish and install materials and devices as needed to properly support this pump within the manhole in conformance with the pump manufacturer's recommendations.
- F. Electric Power Source: The Primary Bypass Pumping system shall be connected to the lift station's electrical system as indicated by the electrical design drawings. It is intended that the motor-driven pumps receive utility power on a normal basis, but will also be powered by the lift station's standby power system in the event of loss of utility power.

2.1.2 ENGINE-DRIVEN SELF-PRIMING PUMP (BACKUP BYPASS PUMP)

- A. The Backup Bypass Pump could be diesel engine driven, self-priming type and could be trailer-mounted or skid-mounted. The intended bypass pumping concept is that this pump will operate only when the Primary pump fails or is otherwise unable to match the sewage inflow rate. This pump would take suction from the Influent Manhole, and shall discharge to the newly-constructed permanent bypass pumping connection. Pump shall be able to pass, without clogging, sewage solids that are commonly found in municipal sewage.
- B. The Backup Bypass Pump could have the following operating characteristics (at full speed):
 - Shutoff Head: 168 feet
 - Rated Capacity: 2,000 gpm at 124 feet
 - Allowable Operating Range: 600 gpm to 3,000 gpm (at full speed).
- C. The Backup Bypass Pump shall be able to automatically prime to 28 feet of suction lift from dry. Indefinite dry-running shall be possible. This pumping unit shall be furnished with silencer and sound enclosure as required to limit its measured noise level to a maximum of 65 dba (measured at 30 feet from the pump).
- D. Contractor shall furnish and install all appurtenances and accessories, including power lines and control devices that are required for a complete, functioning pumping system.

2.2 TEMPORARY PIPING AND VALVING REQUIREMENTS

- A. Temporary suction and discharge piping for bypass pumps: Piping shall be HDPE (DR 17 minimum) or approved equal. Contractor shall restrain pipe joints and overall piping system as necessary to prevent movement of pipe or separation of pipe joints. Temporary piping and valving shall be 10-inch diameter unless otherwise approved by Owner. Under no circumstances will aluminum "irrigation" type piping or glued PVC pipe be allowed. Discharge hose will only be allowed in

short sections and by specific permission from the Engineer.

- B. Provide a temporary shutoff valve for each bypass pump so that each pump can be maintained while the bypass pumping system remains in operation. Shutoff valves shall be resilient wedge gate valves or approved equal.
- C. Provide a temporary check valve for each bypass pump. Check valves shall be suitable for raw sewage service.
- D. Provide a temporary pneumatic plug between the influent manhole and wetwell to prevent flow into the lift station's wetwell during bypass pumping operations.
- E. Both bypass pumps shall discharge to the permanent bypass pump connection. A single 10-inch diameter connection will be available for that purpose. Contractor shall, at his option, provide temporary fittings to allow separate connection of the primary and backup bypass pumps to the permanent point of connection, or may combine the flow from both bypass pumps upstream of the permanent connection so that only one point of connection is required.
- F. Contractor shall provide the necessary stop/start controls for each pump.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Make field measurements needed to install sewage bypass equipment before submitting shop drawings or ordering. Make minor changes in dimensions and alignments as needed to avoid utilities or structural conflicts.
- B. Examine areas and conditions under which work of this section will be performed. Correct conditions detrimental to timely and proper completion of Work.
- C. Fully test bypass system (all equipment) prior to commencing bypass operation including:
 - 1. Pressure testing piping at test pressure specified above with potable water prior to introducing sewage to line.
 - 2. Inspecting piping for leaks and repair or replace leaking sections and joints.
 - 3. Testing pumping system, including back-up pumps.
- D. All material and equipment identified in spill contingency plan, including control measures in event of spill shall be on-site prior to commencing bypass operation.

3.2 INFLUENT MANHOLE (IF USED FOR A SUBMERSIBLE BYPASS PUMP)

- A. The influent sewer manhole cover (36-inch diameter) shall be removed to allow installation of the following items:

- The submersible pump (during its installation and removal); and to accommodate this pump's power and control cables.
 - The discharge pipe from the submersible pump (primary bypass pump)
 - The suction pipe from the self-priming pump (backup bypass pump)
 - The water level measurement system and associated alarms.
- B. Contractor shall seal the top of this manhole during bypass pump system operation to preclude odor release.

3.3 BYPASS PUMPING PROCEDURES

- A. The following installation standards shall be followed:
1. Applicable OSHA and Cal OSHA regulations
 2. Applicable Regional Water Quality Control Standards.
 3. Other applicable building, fire, and plumbing code requirements.
- B. Refer variances between above documents and Contract Documents to Owner's Representative.
- C. Bypass sewage as follows:
1. During bypass pumping, sewage shall not be leaked, dumped or spilled onto any area outside sewer system. When bypass pumping operations are complete, drain all piping into sanitary sewer prior to disassembly. In the event sewage accidentally drains into storm drainage system or street, immediately stop overflow, notify Owner and Owner's Representative, and take necessary action to clean up and disinfect spillage to Owner's satisfaction. If sewage is spilled onto public or private property, wash down, clean up, and disinfect spillage to satisfaction of Owner, property owner, Owner's Representative, and applicable Regional Water Quality Control Boards.
 2. Take all necessary precautions, including monitoring of bypass pumping to prevent sewage spills due to back-up and/or overflow resulting from breakage or blockage of bypass system. Provide experienced personnel knowledgeable in bypass equipment operation to monitor each bypass when installed and operating. Owner will allow Bypass system to be left unattended at the end of the Contractor's work day. However, Contractor shall furnish devices that are tied-in to the lift station's SCADA system to immediately notify City personnel and Contractor's personnel that a bypass pumping fault has occurred. Contractor shall be liable for all cleanup, damages, and resultant fines in event of a spill.
 3. Protect pumps and piping from damage, vandalism, and/or theft to maximum extent possible and as shown on Plans.

4. After Work is completed, remove temporary bypass system. Return surrounding area, including all hardscape and landscape to pre-construction condition.
 5. Contractor shall be responsible for all labor, materials, equipment, and incidentals associated with temporary controls and diversions required to maintain uninterrupted flow in all existing sewer lines associated with this project.
- D. Contractor shall repair without cost to Owner any damage resulting from Contractor's negligence, inadequate or improper installation, maintenance and operation of bypassing and a dewatering system including mechanical or electrical failures.

3.4 PRECAUTIONS

- A. Extra Materials:
1. Spare parts for pumps and piping shall be kept on-site as required.
 2. Adequate hoisting equipment for each pump and accessories shall be maintained on the site.
- B. During all bypass pumping operation, the Contractor shall protect the bypass pumping system, suction and discharge lines, Power and Control cabling, and other system appurtenances from damage inflicted by any equipment or work provided by Contractor. Contractor shall be responsible for all physical damage to the bypass pumping system caused by human or mechanical failure.
- C. When working inside the Influent Manhole, Contractor shall exercise caution and comply with OSHA requirements when working in the presence of sewer gases, combustible or oxygen-deficient atmospheres, and confined spaces.

3.5 FIELD QUALITY CONTROL

- A. Field testing shall include:

ITEM	TEST FOR	TEST STANDARD (ASTM OR OTHER TEST STANDARD)	FREQUENCY	FIRST TEST PAID FOR BY	RETESTS PAID FOR BY
Bypass System	No Spills	Comply with NPDES Permit Requirements	1 inspection	Contractor	Contractor

**** END OF SECTION ****

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**SECTION 33 05 16
PRECAST CONCRETE UTILITY STRUCTURES**

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Materials, testing, and installation of precast concrete vaults.

1.2 RELATED WORK

- A. Section 01 30 00: Contractor Submittals
- B. Section 01 40 00: Quality Control
- C. Section 01 53 00: Protection of Existing Facilities
- D. Section 01 55 00: Site Access and Storage
- E. Section 01 60 00: Products, Materials, Equipment and Substitutions
- F. Section 03 20 00: Concrete Reinforcing
- G. Section 03 30 00: Cast-in-Place Concrete
- H. Section 07 72 33: Floor Hatches
- I. Section 31 23 33: Trenching and Backfilling

1.3 SYSTEM DESCRIPTION

- A. Furnish and install complete precast concrete vault including appurtenant structural, mechanical and/or electrical mountings or connections required for compliance with Manufacturer's installation requirements and compliance with applicable building codes and standards.
- B. Precast concrete vault dimensions shown on Plans are interior dimensions.

1.4 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workmen trained and experienced in necessary trades and crafts and completely familiar with specified requirements and methods for proper performance of Work of this section.
- B. Factory testing shall include:

ITEM	TEST FOR	TEST STANDARD (ASTM OR OTHER TEST STANDARD)	FREQUENCY	FIRST TEST PAID FOR BY	RETESTS PAID FOR BY
Concrete Vault	Concrete Strength	ASTM C31	Submit certified test record on request	Contractor	Contractor

1.5 REFERENCES

- A. ASCE 7 Building Code Requirements for Minimum Design Loads in Buildings and Other Structures
- B. ASTM A615 Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
- C. ASTM C31 Making and Curing Concrete Test Specimens in the Field
- D. ASTM C150 Portland Cement

- E. ASTM C913 Precast Concrete Water and Wastewater Structures
- F. ASTM D1557 Laboratory Compaction Characteristics of Soil Using Modified Effort
- G. California Building Code (CBC)
- H. CRSI Manual of Standard Practice

1.6 SUBMITTALS

A. Furnish the following submittals.

SUBMITTAL	DESCRIPTION
Shop Drawings	Required per structural shop drawing requirements
Catalog Data	Required per catalog data requirements.
Installation Instructions	Required per installation instruction requirements
Engineering Calculations	Required for rebar for vaults over 10' deep or with lateral footing loads per engineering calculations requirements sealed by licensed California Civil Engineer. Required to justify designs less than Class 700 specified.
	Required for concrete mix design per engineering calculations requirements sealed by licensed California Civil Engineer.
Test Record Transcripts	Submit for factory tests per test record transcript requirements
Warranty	Furnish one-year warranty from date of final acceptance

B. Refer to Section 01 30 00 for definition of requirements for shop drawings, catalog data, installation instructions, engineering calculations, and test record transcripts.

1.7 DELIVERY, STORAGE AND HANDLING

A. Refer to contract documents for delivery, storage, and handling requirements.

B. Manufacturer's instruction and warranty requirements for delivery, storage and handling of precast concrete vaults shall be strictly followed.

1.8 PAYMENT

A. Payment for Work in this section shall be included as part of the lump-sum for Bid Item No. 1.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Acceptable Manufacturers include:

ITEM	MANUFACTURER	MANUFACTURER LOCATION
Electrical Pull Boxes	J &.R Concrete Products	Perris, CA
	Oldcastle Precast (formerly Utility Vault)	Fontana, CA (800) 626-3860
	Accepted Equal	
Meter Boxes - Concrete	Brooks Products	Ontario, CA
	Eisel Enterprises, Inc.	Placentia, CA
	Jensen Precast	Sparks, NV
	J &.R Concrete Products	Perris, CA
	Oldcastle Precast (formerly Utility Vault)	Fontana, CA (800) 626-3860

ITEM	MANUFACTURER	MANUFACTURER LOCATION
	Accepted Equal	
Meter Boxes - Composite	Armorcast 600 series	Ontario, CA
	J & R Concrete Products PW4 or PW5	Perris, CA
	Applied Engineering Products	Chino, CA
	Accepted Equal	
Utility Vaults		
	Brooks Products	Ontario, CA
	Eisel Enterprises, Inc.	Placentia, CA
	Jensen Precast	Sparks, NV
	J & R Concrete Products	Perris, CA
	Olson Precast Company	Rialto, CA
	Oldcastle Precast (formerly Utility Vault)	Fontana, CA (800) 626-3860
	Accepted Equal	

2.2 MATERIALS

- A. Refer to Section 01 60 00 for basic requirements for products and materials.
- B. Precast concrete vaults shall be constructed of the following materials:

ITEM	MATERIAL	SPECIFICATION
Vault	Portland Cement Concrete	See Section 03 30 00 Fly ash not permitted
	Steel Reinforcing	See Section 03 20 00
Hatches, Lids, Frames	Metals	See Section 07 72 33
Joint Sealant	Grout	See Section 03 60 00
	Mortar	One part Portland cement to two parts well-graded sand passing No. 8 sieve per Section 03 30 00.
	Plastic Sealing Compound	See Section 07 92 00

- C. The following product design criteria, options and accessories are required:

ITEM	DESCRIPTION	
Pre-Cast Concrete Vault Sections	Design Surcharge and Lateral Earth Pressure	AASHTO H-20 Loading
	Minimum 28-day Compressive Strength f'_c	4000 psi
	Steel Reinforcing Yield Strength f_y	60 ksi
Rectangular Box Wall Design	Wall Design	Class 700, or submit sealed engineering calculations justifying a lesser design.
	Roof Design	Design for H-20
	Dimensions	per ASTM C913 Table X1.1
	Reinforcement	per ASTM C913 Table X1.2

PART 3 - EXECUTION

3.1 PREPARATION

- A. Make field measurements needed to install precast concrete vaults before submitting shop drawings or ordering. Make minor changes in dimensions and alignments as needed to avoid utilities or structural conflicts.

3.2 INSTALLATION

- A. Refer to Section 31 23 33 for open trench requirements.
- B. Furnish and install precast concrete vaults at locations shown on Plans and submittals.
- C. The following installation standards shall be followed:
 - 1. Manufacturer’s installation and warranty requirements
 - 2. Applicable OSHA and Cal OSHA regulations
 - 3. Applicable building code requirements
- D. Refer variances between above documents and Contract Documents to Owner’s Representative.
- E. Install precast concrete vaults to tolerances recommended by Manufacturer. Unless otherwise shown, install precast concrete vaults true, plumb, and level using precision gauges and levels.

3.3 FIELD QUALITY CONTROL

- A. Field testing shall include:

ITEM	TEST FOR	TEST STANDARD (ASTM OR OTHER TEST STANDARD)	FREQUENCY	FIRST TEST PAID FOR BY	RETESTS PAID FOR BY
Precast Concrete Vaults	Installation & Leakage	Visual inspection of finished installation	1 inspection	Owner	Owner
	Field Performance	Demonstrate compliance to Contract Documents and Manufacturer’s printed Literature	1 test	Contractor	Contractor
	11-month Warranty Inspection	Demonstrate compliance to Contract Documents and Manufacturer’s printed literature	1 test	Owner	Contractor

**** END OF SECTION ****

**SECTION 33 05 26
UTILITY IDENTIFICATION**

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Materials, testing, and installation of buried utility identification systems including signs, markers, flags, warning tape, and trace wires.
- B. Furnish and install buried pipeline marker tape over the new ductile iron piping that will be installed near the lift station building, within the fenced pump station site.

1.2 RELATED WORK

- A. Section 01 30 00: Contractor Submittals
- B. Section 01 40 00: Quality Control
- C. Section 01 53 00: Protection of Existing Facilities
- D. Section 01 55 00: Site Access and Storage
- E. Section 01 60 00: Products, Materials, Equipment and Substitutions
- F. Section 09 90 00: Protective Coatings

1.3 SYSTEM DESCRIPTION

- A. Furnish and install complete utility identification products including appurtenant structural, mechanical and/or electrical mountings or connections required for compliance with Manufacturer's installation requirements and compliance with applicable building; fire, electrical, plumbing, and mechanical codes and standards.

1.4 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workmen trained and experienced in necessary trades and crafts and completely familiar with specified requirements and methods for proper performance of Work of this section.

1.5 REFERENCES

- A. California Fire Code (CFC)
- B. California Mechanical Code (CMC)
- C. California Plumbing Code (CPC)
- D. NFPA 70 National Electric Code (NEC)
- E. OSHA Standard 29 CFR
- F. 2015 Greenbook
- G. 2015 Whitebook

1.6 SUBMITTALS

- A. Furnish the following submittals.

SUBMITTAL	DESCRIPTION	
Catalog Data	Required per catalog data requirements.	

SUBMITTAL	DESCRIPTION	
Installation Instructions	Required per installation or application instruction requirements.	
Material Samples	Required	
Warranty	Furnish one-year warranty from date of final acceptance	

- B. Refer to Section 01 30 00 for definition of requirements for catalog data, installation instructions, and material samples.

1.7 DELIVERY, STORAGE AND HANDLING

- A. Refer to contract documents for delivery, storage, and handling requirements.
- B. Manufacturer's instruction and warranty requirements for delivery, storage and handling of utility identification products shall be strictly followed.

1.8 PAYMENT

- A. Payment for Work in this section shall be included as part of the lump-sum for Bid Item No. 1.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Acceptable Manufacturers include:

ITEM	MANUFACTURER	MANUFACTURER LOCATION
Detectable Warning Tape for Installation within 12" of Surface	Calpico, Inc. "Type II"	South San Francisco, CA
	T Christy Enterprises (714) 507-3300	Anaheim, CA
	Terra Tape Division Reef Industries	Houston, TX
	Accepted equal	
Non-detectable Warning Tape	Calpico, Inc. "Type I"	South San Francisco, CA
	T Christy Enterprises (714) 507-3300	Anaheim, CA
	Terra Tape Division Reef Industries	Houston, TX
	Accepted equal	

2.2 MATERIALS

- A. Refer to Section 01 60 00 for basic requirements for products and materials.
- B. Utility identification products shall identify:

FLUID
Potable Water
Wastewater
OTHER
Electrical Conduit
Telephone Lines
Fiber-optic and Communication Lines
Other Utilities

- C. Utility identification products shall be constructed of the following materials:

ITEM	MATERIAL	SPECIFICATION
Identification Tape	Polyethylene	
Locator Tape	Polyethylene	
Warning Tape	Polyethylene	

- D. The following product design criteria, options and accessories are required:

ITEM	DESCRIPTION	
Identification Tape	Type	Non-detectable
	Width	6" / See pipeline specifications
	Thickness	4 mils minimum
	Imprint	See Pipe or Utility Specifications
	Location	Attach to pipe
Warning and Locator Tape	Type	Detectable metallic-strip locator tape that can be registered by magnetic field locating device (for plastic pipe and conduit) / Non-detectable for metallic pipe and conduit
	Width	6" / See pipeline specifications
	Thickness	4 mils minimum
	Imprint	See Pipe or Utility Specifications
	Location	18" above pipe

PART 3 - EXECUTION

3.1 PREPARATION

- A. Examine areas and conditions under which work of this section will be performed. Correct conditions detrimental to timely and proper completion of Work.

3.2 INSTALLATION

- A. Furnish and install utility identification products at locations shown on Plans and Submittals.
- B. The following installation standards shall be followed:
1. Manufacturer's installation and warranty requirements
 2. Applicable OSHA and Cal OSHA regulations
 3. Other applicable fire, plumbing, mechanical and electrical code requirements
- C. Refer variances between above documents and Contract Documents to Owner's Representative.
- D. Install utility identification products to tolerances recommended by Manufacturer.

3.3 FIELD QUALITY CONTROL

- A. Field testing shall include:

ITEM	TEST FOR	TEST STANDARD (ASTM OR OTHER TEST STANDARD)	FREQUENCY	FIRST TEST PAID FOR BY	RETESTS PAID FOR BY
Utility Identification Products	Installation	Visual inspection of finished installation	1 inspection	Owner	Owner

** END OF SECTION **

**SECTION 33 05 31
PIPING JOINT MATERIALS**

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Materials, testing, and installation of piping joint materials including bolts, nuts, washers, and flange gaskets.
- B. Bolts and nuts for flanges, sleeve type couplings and flange coupling adaptors and harnesses shall use materials specified herein.

1.2 RELATED WORK

- A. Section 01 30 00: Contractor Submittals
- B. Section 01 40 00: Quality Control
- C. Section 01 53 00: Protection of Existing Facilities
- D. Section 01 55 00: Site Access and Storage
- E. Section 01 60 00: Products, Materials, Equipment and Substitutions
- F. Section 09 90 00: Protective Coatings
- G. Section 33 05 33: Couplings and Unions

1.3 SYSTEM DESCRIPTION

- A. Furnish and install bolts, nuts, washers and flange gaskets where required, including appurtenant structural, mechanical and/or electrical mountings or connections required for compliance with Manufacturer's installation requirements and compliance with applicable codes and standards.

1.4 REFERENCES

- A. ASME/ANSI B1.1 Unified Inch Screw Threads, UN and UNR Thread Form
- B. ASME/ANSI B16.1 Gray Iron Pipe Flanges and Flanged Fittings – Classes 25, 125, and 250
- C. ASME/ANSI B16.4 Gray Iron Threaded Fittings: Classes 125 and 250
- D. ASME/ANSI B16.5 Pipe Flanges and Flanged Fittings: NPS ½ through NPS 24
- E. ASME/ANSI B16.21 Non Metallic Flat Gaskets for Pipe Flanges
- F. ASME/ANSI B16.24 Cast Copper Alloy Pipe Flanges and Flanged Fittings
- G. ASME/ANSI B16.42 Ductile Iron Pipe Flanges and Flanged Fittings, Classes 150, 300, 600, 900, 1500 and 2500.
- H. ASME/ANSI B16.47 Large Diameter Steel Flanges: NPS 26 Through NPS 60
- I. ASME/ANSI B18.2.1 Square, Hex, Heavy Hex, and Askew Head Bolts and Hex, Heavy Hex, Hex Flange, Lobed Head, and Lag Screws (Inch Series)
- J. ASME/ANSI B18.2.2 Nuts for General Applications: Machine Screw Nuts, Hex, Square, Hex Flange, and Coupling Nuts (Inch Series)
- K. ASME/ANSI B1.20.1 (ANSI B2.1) Pipe Threads, General Purpose (Inch)
- L. ASME/ANSI B31.3 Process Piping
- M. ASTM A193 Alloy-Steel and Stainless Steel Bolting for High-Temperature or High Pressure Service and Other Special Purpose Applications

- N. ASTM A194 Carbon Steel, Alloy Steel, and Stainless Steel Nuts for Bolts for High Pressure or High Temperature Service, or Both
- O. ASTM A307 Carbon Steel Bolts, Studs, and Threaded Rod 60,000-psi Tensile Strength
- P. ASTM A563 Carbon and Alloy Steel Nuts
- Q. ASTM B98 Copper-Silicon Alloy Rod, Bar and Shapes
- R. ASTM F467 Nonferrous Nuts for General Use
- S. ASTM F468 Nonferrous Bolts, Hex Cap Screws, Socket Head Cap Screws, and Studs for General Use
- T. ASTM F593 Stainless Steel Bolts, Hex Cap Screws, and Studs
- U. ASTM F594 Stainless Steel Nuts
- V. AWWA C111 Rubber Gasket Joints for Ductile Iron Pressure Pipe and Fittings
- W. AWWA C115/ANSI A21.15 Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron Threaded Flanges
- X. AWWA C207 Steel Pipe Flanges for Waterworks Service, Sizes 4 In. Through 144 In.

1.5 SUBMITTALS

- A. Furnish the following submittals.

SUBMITTAL	DESCRIPTION	
Catalog Data	Required per catalog data requirements.	

- B. Refer to Section 01 30 00 for definition of requirements for catalog data.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Refer to contract documents for delivery, storage, and handling requirements.
- B. Manufacturer's instruction and warranty requirements for delivery, storage and handling of bolts, nuts, washers and flange gaskets shall be strictly followed.

1.7 PAYMENT

- A. Payment for Work in this section shall be included as part of the lump-sum for Bid Item No. 1.

PART 2 – PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Acceptable Manufacturers include:

ITEM	MANUFACTURER	MANUFACTURER LOCATION
Anti-Seize Compound for Stainless Steel Bolts and Nuts	Bostik Never Seez	
	Christy's Anti-seize	Anaheim, CA
	Husk-It Husky Lube O-Seal	
	Loctite	
	Permatex	
	Ramco Antiseize	Huntington Beach, CA

ITEM	MANUFACTURER	MANUFACTURER LOCATION
	Ramco TRX-Synlube	Huntington Beach, CA
	Accepted Equal	
Bolts and Nuts	Industrial Threaded Products, Inc.	Brea, CA
	Ocean State Stainless, Inc.	Huntington Beach, CA
	Pacific Coast Bolt	Santa Fe Springs, CA
	Tripac Fasteners	Corona, CA
	Western Pacific Products	Corona, CA
	Accepted Equal	
Flange Gaskets – Cloth-Inserted	Bluegard Div. Garlock, / Inc. Style 5000	Palmyra, NY
	Buffalo Rubber Matting LLC	Buffalo, NY
	John Crane (Cranite)	Cerritos, CA
	Johns Manville 60	
	Richard Klinger C4400	Sidney, OH
	Tripac Style 5000	Corona, CA
	Western Pacific Products	Corona, CA
	Accepted equal	
Flange Gaskets – Neoprene	Bluegard Div. Garlock, Inc. Style 2000	Palmyra, NY
	Buffalo Rubber Matting LLC	Buffalo, NY
	John Crane (Cranite)	Cerritos, CA
	Johns Manville 60	
	Richard Klinger C4400	Sidney, OH
	Tripac Style 2000	Corona, CA
	Western Pacific Products	Corona, CA
	Accepted equal	
Flange Gaskets – Low-Torque for Use with Plastic Flanges	Proco Series 9013	Stockton, CA
	Accepted equal	

2.2 MATERIALS

- A. Refer to Section 01 60 00 for basic requirements for products and materials.
- B. Unless otherwise specified, bolts, nuts and washers for pipe assembly below ground shall meet the following requirements.

ITEM	MATERIAL	SPECIFICATION
Bolts for Underground Ferrous Installations (Buried or in Underground Structures)	SAE Type 316 Stainless Steel	ASTM A193 B8M T-316 Heavy hexagon series ANSI B1.1 Class 2A fit ¼" to ½" shall project through tightened nut Threading per ANSI/ASME B18.2.1 Bolt-Head Identification Mark – "B8M"
Nuts for Underground	SAE Type 316	ASTM A194 8M-T316

ITEM	MATERIAL	SPECIFICATION
Ferrous Installations (Buried or in Underground Structures)	Stainless Steel	Heavy hexagon series ANSI B1.1 Class 2B fit ¼" to ½" shall project through tightened nut Threading per ANSI/ASME B18.2.2
Coating for New Bolts and Nuts on Flanges	Nickel-phosphate Undercoating Blue Teflon or Xylan Fluoropolymer Coating	
Coating for Existing Bolts and Nuts	Antiseize Lubricant	
Washers	Washer material shall be same as each bolt.	Provide washer for each nut.
Coating for Buried Nuts and Bolts	Accepted Manufacturer's coating listed above	2 coats minimum 15 mils per coat

C. Unless otherwise specified, flange gaskets shall meet the following requirements.

ITEM	MATERIAL	SPECIFICATION	
Flange Gaskets on Metallic Flanges	Standards	ANSI B16.21	
	Material	SBR Styrene Butadiene Rubber Non-asbestos	
	Alternate Material		EPDM (ethylene propylene)
			FKM (Viton or FLUOREL) fluorocarbon
			NBR Nitrile (acrylonitrile butadiene)
			Neoprene (polychloroprene)
			PTFE (Teflon or GoreTex)
			SBR-Fiber Non-Asbestos Composite
Thickness		⅛" minimum (SBR) or other materials 1/16" minimum (PTFE - Teflon)	
Working Pressure Rating		350 psi at 180°F	
Style		Full-face type with pre-punched boltholes where both flanges are flat face.	
		Ring flange gaskets extending to inner edge of bolts may be used where raised-face flange is present.	
		Steel flange shall be flat face where adjoining flange is steel.	
Flange Gaskets on PVC, CPVC, and Fiberglass Flanges		Full-faced, ⅛"-thick Elastomer, Shore "A" of 70 Durometer Non-creeping PTFE with insert filler Teflon ring or Teflon envelope Suitable for pressures to 150 psi Suitable for temperatures to 120°F Suitable and chemically compatible with conveyed fluid.	

PART 3 - EXECUTION

3.1 PREPARATION

- A. Clean and wire brush flange faces of pipe, valves and pipeline equipment before joining to adjacent flanges. Clean flange bolts and nuts by wire brushing. Lubricate threads with oil and graphite. Tighten nuts uniformly and progressively.

3.2 INSTALLATION

- A. Furnish and install bolts, nuts, washers and flange gaskets at locations shown on Plans and Submittals.
- B. The following installation standards shall be followed:
 - 1. Manufacturer's installation and warranty requirements
 - 2. Applicable OSHA and Cal OSHA regulations
 - 3. Applicable building, fire, plumbing, and mechanical code requirements
- C. Refer variances between above documents and Contract Documents to Owner's Representative.
- D. Do not force fit or spring pipe, conduit or equipment into place. Corrective measures for cases of poor alignment shall be approved in advance by Owner's Representative.
- E. Deflections at joints shall not exceed 80% of Manufacturers' published tolerance limits.
- F. Mitered piping joints are not permitted.
- G. Non-fabricated pipe bends shall conform to ASME/ANSI B31.3 and be free from wrinkles, creases or corrugations.
- H. Water pipe bends shall use approved AWWA fittings, except steel water pipe fittings in vaults or above grade may match API dimensions subject to Owner's approval.
- I. Cut pipe threads with sharp dies and made up with approved thread sealing compound. Threads to be seal welded shall be made up dry. Do not use Teflon sealers.
- J. Epoxy coated pipe, valves and fittings shall be fabricated and installed without cutting, notching or welding.
- K. Threaded pipe joints shall be cleaned by wire brushing or swabbing. Apply Teflon joint compound or Teflon tape to pipe threads before installing threaded valves.
- L. Assemble flanges as follows:
 - 1. Clean flange surfaces to mate with gasket, removing loose dirt, scale and detritus.
 - 2. Repair pits, corrosion, dents or scratches which may make sealing impossible.

3. Inspect gasket to verify gasket is of proper material and style, free of defects or damage.
4. Inspect flange bolts and studs for proper material, size, threading and length.
5. Clean and lubricate bolt threads and nut contact surfaces using lubricant chemically compatible with all materials involved.
6. Center gasket on flange.
7. With gasket in place, align mating flange bolt holes. Make sure mating flange faces are flush against gasket prior to bolt-up.
8. Insert bolts, nuts and washers. Hand-tighten by hand until snug.
9. Before tightening bolts beyond hand-tight, operate adjacent valves through full range of motion to ensure clear unobstructed operation of discs and other internal parts.
10. Tighten bolts in sequence by 5-lb. increments following a 180° opposing sequence. Begin with the bolt nearest the 12-o'clock position, proceed to the opposing bolt nearest the 6-o'clock position, then to 3-o'clock and 9-o'clock and continue tightening in a similar alternating sequence until all bolts are tight.
11. Since gaskets relax after seating, retighten 24 hours after installation and pressure testing to compensate for any relaxation.
12. Flange bolt torques shall be as recommended by valve, appurtenance, or pipe manufacturer:

3.3 FIELD QUALITY CONTROL

A. Field testing shall include:

ITEM	TEST FOR	TEST STANDARD (ASTM OR OTHER TEST STANDARD)	FREQUENCY	FIRST TEST PAID FOR BY	RETESTS PAID FOR BY
Pipeline Joint Materials	Installation & Leakage	Visual inspection of finished installation	1 inspection	Owner	Owner
	11-month Warranty Inspection	Demonstrate compliance to Contract Documents and Manufacturer's printed literature	1 test	Owner	Contractor

B. If flanges leak under pressure testing, loosen or remove nuts and bolts, replace flange gasket, reinstall or retighten bolts and nuts and retest joints. Joints shall be watertight.

**** END OF SECTION ****

**SECTION 33 05 33
COUPLINGS AND UNIONS**

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Materials, testing, and installation of couplings, unions, and appurtenant joint and coating systems.

1.2 RELATED WORK

- A. Section 01 30 00: Contractor Submittals
- B. Section 01 40 00: Quality Control
- C. Section 01 53 00: Protection of Existing Facilities
- D. Section 01 55 00: Site Access and Storage
- E. Section 01 60 00: Products, Materials, Equipment and Substitutions
- F. Section 09 90 00: Protective Coatings
- G. Section 09 96 56: Epoxy Linings and Coatings
- H. Section 33 05 31: Piping Joint Materials

1.3 SYSTEM DESCRIPTION

- A. Furnish and install complete functional coupling, joint system including appurtenant structural, and mechanical mountings, thrust restraints, or connections and coatings required for compliance with Manufacturer's installation requirements, and compliance with AWWA and other applicable standards.

1.4 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workmen trained and experienced in necessary trades and crafts and completely familiar with specified requirements and methods for proper performance of Work of this section.
- B. Before ordering materials to fit outside diameters of existing pipe of uncertain dimensions, including but not limited to cast iron pipe, pipe over 16" diameter, and pipe over 50 years old, the following procedures shall be followed:
 - 1. Excavate pipe to be joined at location coupling or restraint will be installed.
 - 2. Field measure pipe circumference at that location.
 - 3. Without removing pipe from service, measure outside diameters along x-axis and y-axis.
 - 4. Verify roundness of existing pipe is within Manufacturer's tolerances.
 - 5. If existing pipe roundness is outside coupling or restraint Manufacturer's tolerances, it may be necessary to cut pipe being joined and trace outside diameter template on sheet of butcher paper mounted to plywood board to allow custom fittings to be fabricated to match field pipe geometry.

C. Factory testing shall include:

ITEM	TEST FOR	TEST STANDARD (ASTM OR OTHER TEST STANDARD)	FREQUENCY	FIRST TEST PAID FOR BY	RETESTS PAID FOR BY
Fusion-Bonded Epoxy Linings	Holidays and Lining Thickness	See Section 09 96 56	1 each item	Contractor	Contractor

1.5 REFERENCES

- A. ASME/ANSI B16.5 Steel Pipe Flanges and Flanged Fittings: NPS ½ through NPS24
- B. ASME/ANSI B16.39 Malleable Iron Threaded Pipe Unions
- C. ASSE 1079 Performance Requirements for Dielectric Pipe Unions
- D. ASTM A193 Alloy Steel and Stainless Steel Bolting for High-Temperature or High Pressure Service and Other Special Purpose Applications
- E. ASTM A283 Low and Intermediate Tensile Strength Carbon Steel Plates
- F. ASTM A536 Ductile Iron Castings
- G. ASTM B61 Steam or Valve Bronze Castings
- H. ASTM B62 Composition Bronze or Ounce Metal Castings
- I. ASTM C1173 Flexible Transition Couplings for Underground Piping Systems
- J. ASTM D2464 Threaded Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80
- K. AWWA C105 Polyethylene Encasement for Ductile-Iron Pipe Systems
- L. AWWA C207 Steel Pipe Flanges for Waterworks Service – Sizes 4” through 144”
- M. AWWA C111 Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
- N. AWWA C219 Bolted Sleeve Type Couplings for Plain End Pipe
- O. AWWA C550 Protective Interior Coatings for Valves and Hydrants
- P. AWWA M11 Steel Pipe, A Guide for Design and Installation

1.6 SUBMITTALS

- A. Furnish the following submittals.

SUBMITTAL	DESCRIPTION	
Catalog Data	Required per catalog data requirements.	
	Show lining and coating data and thicknesses on items 4” and larger	
Installation Instructions	Required per installation instruction requirements.	
Warranty	Furnish one-year warranty from date of final acceptance	

- B. Refer to Section 01 30 00 for definition of requirements for catalog data, and installation instructions,

1.7 DELIVERY, STORAGE AND HANDLING

- A. Refer to contract documents for delivery, storage, and handling requirements.
- B. Manufacturer’s instruction and warranty requirements for delivery, storage and handling of couplings shall be strictly followed.

1.8 PAYMENT

- A. Payment for Work in this section shall be included as part of the lump-sum for Bid Item No. 1.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Acceptable Manufacturers for bolted sleeve type couplings include:

ITEM	MANUFACTURER	MANUFACTURER LOCATION
Couplings – Steel Bolted Sleeve Type, for Identical Pipe Materials on each side	APAC Products(Model 501)	Livermore, CA
	Baker Coupling Co., Inc. (Series 200)	Los Angeles, CA
	Dresser Piping Specialties (Style 38)	Bradford, PA
	Ford Meter Box Co Inc. (FC3) or (FC4)	Pell City, AL
	JCM Industries, Inc. (Style 201) or (Style 202)	Nash, TX
	Powerseal Pipeline Products Corp (3501).	Wichita Falls, TX
	Romac Industries (400)	Bothell, WA
	Smith Blair, Inc. (Style 411)	Texarkana, TX
	Accepted Equal	
Couplings – Steel Bolted Transition Sleeve Type, for Different Pipe Materials on each side	Baker Coupling Co., Inc. (Series 212)	Los Angeles, CA
	Dresser Piping Specialties (Style 162) or (Style 62TY.1)	Bradford, PA
	Ford Meter Box Co Inc. (FC5)	Pell City, AL
	JCM Industries, Inc. (Style 203)	Nash, TX
	Powerseal Pipeline Products Corp (3501)	Wichita Falls, TX
	Romac Industries (TC400)	Bothell, WA
	Smith Blair, Inc. (Style 413)	Texarkana, TX
	Total Piping Solutions (Hymax)	Olean, NY
	Accepted Equal	
Flanged Coupling Adaptors Note 1: Provide tie-rods or other restraint system where a restrained FCA is required Note 2: FCA's for Pump Suction Piping must be air-tight for a full-vacuum.	Baker Coupling Co., Inc. (Style 602)	Los Angeles, CA
	Romac Industries (FCA501)	Bothell, WA
	JCM Industries, Inc. (Series 300)	Nash, TX
	Accepted Equal	

- B. Acceptable Manufacturers for dismantling joints include:

ITEM	MANUFACTURER	MANUFACTURER LOCATION
Dismantling Joints	Baker Coupling Co., Inc.	Los Angeles, CA
	Dresser Piping Specialties (Style 131)	Bradford, PA
	Romac Industries (Style DJ400)	Bothell, WA
	Smith Blair, Inc. (Style 972)	Texarkana, TX
	Total Piping Solutions (Hyjoint)	Olean, NY

ITEM	MANUFACTURER	MANUFACTURER LOCATION
	Viking Johnson	Cleveland, TN
	Accepted Equal	

C. Acceptable Manufacturers for other coupling products, include:

ITEM	MANUFACTURER	MANUFACTURER LOCATION
Cam Lock Fittings	Banjo Corporation	Crawfordsville, IN
	Central States Hose, Inc.	Denver, CO
	MMC International Co.	Inwood, NY
	Accepted Equal	
Polyethylene Encasement for Buried Couplings and Appurtenances	Christy's "AWWA Polywrap"	Anaheim, CA
	Dupont Alathon	Wilmington, DE
	Northtown Company	Huntington Beach, CA
	Trumbull Industries, Inc.	Youngstown, OH
	Accepted Equal	
Unions (Dielectric Insulating)	Harrington Industrial Plastics, Inc.	Chino, CA
	Lochinvar	
	Pipe Seal and Insulator Company	
	Pipeline Coating and Engineering Company	
	Smith Blair, Inc.	Texarkana, TX
	Spears Manufacturing Company	Sylmar, CA
	Wilkins Operation of Zurn Industries (DU) Series	Gardena, CA
	Accepted Equal	

2.2 MATERIALS

- A. Refer to Section 01 60 00 for basic requirements for products and materials.
- B. Bolted sleeve type couplings shall comply with AWWA C219 and be constructed of the following materials:

ITEM	MATERIAL	SPECIFICATION
Sleeve	Steel	ASTM A283 Grade C or carbon steel with minimum 30-ksi yield
Coupling Bolts	Stainless Steel	See Section 33 05 31.
Gasket		AWWA C111
Sleeve Lining (couplings 3" and larger)	Fusion-Bonded Epoxy	See Section 09 96 56. AWWA C550 12-mil minimum DFT
Exterior Finish Coat	Fusion-Bonded Epoxy	See Section 09 96 56.
Polyethylene Encasement for Buried Couplings and Appurtenances	Polyethylene Sheet	AWWA C105 2 layers, 8 mils each

C. Dismantling joints shall be constructed of the following materials:

ITEM	MATERIAL	SPECIFICATION
Dismantling Joints	Construction	AWWA C219 where applicable
	Spigot	ASTM A283 Steel Grade C or ASTM A536 Grade 65-45-12 Ductile Iron

ITEM	MATERIAL	SPECIFICATION
	Flange Adaptor	ASTM A283 Steel Grade C or ASTM A536 Grade 65-45-12 Ductile Iron
	Gasket	EPDM Grade E or Buna-S
Flanges Working Pressures 0-150 psi	Ductile Iron	ASME/ANSI B16.42 Class 150 Raised or plain faced
Tie Rods – Stainless Steel	Stainless Steel	SAE Type 304 or SAE Type 316
Lining	Epoxy	See Section 09 96 56. AWWA C550 12 mil minimum DFT Do not coat sealing areas and bronze or stainless steel parts.
Exterior Finish Coat	Epoxy Urethane	See Section 09 90 00.
Polyethylene Encasement for Buried Couplings and Appurtenances	Polyethylene Sheet	AWWA C105 2 layers, 8 mils each

D. Unions shall be constructed of the following materials:

ITEM	MATERIAL	SPECIFICATION
Insulating Unions (Use restricted to pipe 2½" and smaller with dissimilar metals on each side of union)	Standard	ASSE 1079, ASTM D2464
	Location	Provide where dissimilar pipe materials mate Provide within 12" of regulating equipment, water heating, conditioning tanks and similar equipment requiring service by removal in manner facilitating ready removal.
	Material	PVC
	Class	Match Adjacent Pipe

E. Sewer transition couplings shall be constructed of the following materials:

ITEM	MATERIAL	SPECIFICATION
Transition Coupling - Sewer	Elastomeric with Stainless Steel tension bands	ASTM C1173

F. The following product design criteria, options and accessories are required:

ITEM	DESCRIPTION	
Coating on Buried Bolts, Nuts and Tie- Rods	See Section 09 90 00. 2 coats minimum 12 mils MDFT per coat	
Dismantling Joints	Self-contained Restraint Rating	Larger of 250 psi or rating of mating flanges
	Dimensions	No part of restraint system shall extend outside flange diameter
	Tie Rod Diameter	Compatible with mating flange bolt diameter
	Minimum Longitudinal Adjustment	5" 4" inward adjustment, 1" expansion

G. Flanges shall conform to AWWA C207 requirements and shall mate with adjacent valves or fittings.

- H. Internal bore of couplings and joints shall be as close to that of pipe system as is commercially available.
- I. All coupling products referenced in this section shall be painted and coated, interior and exterior in accordance with Section 09 90 00 or 09 96 56 as applicable.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Make field measurements needed to install products before submitting shop drawings or ordering. Make minor changes in dimensions and alignments as needed to avoid utilities or structural conflicts.
- B. On buried couplings and assemblies, lubricate all threaded parts including bolts and compression collars before assembling couplings and joints.

3.2 INSTALLATION

- A. Furnish and install couplings and unions at locations shown on Plans and Submittals.
- B. The following installation standards shall be followed:
 - 1. Manufacturer's installation and warranty requirements
 - 2. Applicable OSHA and Cal OSHA regulations
 - 3. Applicable building, fire, plumbing and mechanical code requirements
 - 4. AWWA M11 Steel Pipe, A Guide for Design and Installation
- C. Refer variances between above documents and Contract Documents to Owner's Representative.
- D. Couplings and unions shall be furnished and installed by Contractor at location shown on Plans and Submittals.
- E. Bolting shall be completed as follows:
 - 1. Wire brush and clean flange before joining flange.
 - 2. Lubricate bolt threads with graphite and oil.
 - 3. Bolt heads and nuts shall rest squarely against metal. Draw bolt heads and nuts tight against Work using suitable wrench not less than 15" long or torque wrench set to provide similar torque. Tap bolt heads with hammer while nut is being tightened. After being tightened, nuts shall be locked.
 - 4. Bolts shall extend entirely through nut projecting at least 1/4" but not more than 3/8" beyond outside nut face.

F. Unless otherwise shown, encase all buried couplings and appurtenances with 2 layers of polyethylene wrap.

3.3 FIELD QUALITY CONTROL

A. Field testing shall include:

ITEM	TEST FOR	TEST STANDARD (ASTM OR OTHER TEST STANDARD)	FREQUENCY	FIRST TEST PAID FOR BY	RETESTS PAID FOR BY
Couplings, and Unions	Installation & Leakage	Visual inspection of finished installation	1 inspection	Owner	Owner
	Field Performance	Demonstrate compliance to Contract Documents and Manufacturer's printed literature	1 test	Contractor	Contractor
	11-month Warranty Inspection	Demonstrate compliance to Contract Documents and Manufacturer's printed literature	1 test	Owner	Contractor

**** END OF SECTION ****

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**SECTION 33 05 34
GROOVED AND SHOULDERED (VICTAULIC-STYLE) COUPLINGS**

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Materials, testing, and installation of grooved and shouldered couplings and appurtenant coating systems.

1.2 RELATED WORK

- A. Section 01 30 00: Contractor Submittals
- B. Section 01 40 00: Quality Control
- C. Section 01 53 00: Protection of Existing Facilities
- D. Section 01 55 00: Site Access and Storage
- E. Section 01 60 00: Products, Materials, Equipment and Substitutions
- F. Section 09 90 00: Protective Coatings
- G. Section 09 96 56: Epoxy Linings and Coatings
- H. Section 33 05 31: Pipeline Joint Materials
- I. Section 33 05 33: Couplings and Unions
- J. Section 33 11 19: Mastic and Tape-Wrap Systems for Ferrous Pipe

1.3 SYSTEM DESCRIPTION

- A. Furnish and install complete functional thrust-restraining coupling system including appurtenant coatings required for compliance with Manufacturer's installation requirements, and compliance with AWWA and other applicable standards.

1.4 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workmen trained and experienced in necessary trades and crafts and completely familiar with specified requirements and methods for proper performance of Work of this section.
- B. Factory testing shall include:

ITEM	TEST FOR	TEST STANDARD (ASTM OR OTHER TEST STANDARD)	FREQUENCY	FIRST TEST PAID FOR BY	RETESTS PAID FOR BY
Fusion Bonded Epoxy Linings	Holidays and Lining Thickness	See Section 09 96 56	1 each item	Contractor	Contractor

1.5 REFERENCES

- A. ASTM A47 Ferritic Malleable Iron Castings
- B. ASTM A183 Carbon Steel Track Bolts and Nuts
- C. ASTM A193 Alloy Steel and Stainless Steel Bolting Materials for High-Temperature or High Pressure Service and Other Special Purpose Applications

- D. ASTM A283 Low and Intermediate Tensile Strength Carbon Steel Plates
- E. ASTM A449 Hex Cap Bolts, Screws, and Studs
- F. ASTM A536 Ductile Iron Castings
- G. ASTM D2000 Classification System for Rubber Products in Automotive Applications
- H. AWWA C105 Polyethylene Encasement for Ductile-Iron Pipe Systems
- I. AWWA C550 Protective Interior Coatings for Valves and Hydrants
- J. AWWA C606 Grooved and Shouldered Joints
- K. AWWA M11 Steel Pipe, A Guide for Design and Installation
- L. NSF/ANSI 61 Drinking Water System Components – Health Effects

1.6 SUBMITTALS

- A. Furnish the following submittals.

SUBMITTAL	DESCRIPTION	
Catalog Data	Required per catalog data requirements.	
	Show lining and coating data and thicknesses on items 4" and larger	
Installation Instructions	Required per installation instruction requirements.	
Warranty	Furnish one-year warranty from date of final acceptance	

- B. Refer to Section 01 30 00 for definition of requirements for catalog data, and installation instructions,

1.7 DELIVERY, STORAGE AND HANDLING

- A. Refer to contract documents for delivery storage and handling requirements.
- B. Manufacturer's instruction and warranty requirements for delivery, storage and handling of couplings, and tie rods shall be strictly followed.

1.8 PAYMENT

- A. Payment for Work in this section shall be included as part of the lump-sum for Bid Item No. 1.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Acceptable Manufacturers for couplings for ductile iron pipe include:

ITEM	MANUFACTURER	MANUFACTURER LOCATION
Couplings – Grooved Type for Ductile Iron Pipe 3"-36"	Piedmont Pacific Corporation.	Oakland, CA
	Shurjoint Piping Products	Las Vegas, NV
	Star Pipe Products, Inc.	Easton, PA
	Victaulic Company of America, Inc. (Style 31)	Easton, PA
	Accepted Equal	
Polyethylene Encasement for Buried Couplings and Appurtenances	Christy's "AWWA Polywrap"	Anaheim, CA
	Dupont Alathon	Wilmington, DE
	Northtown Company	Huntington Beach, CA
	Trumbull Industries, Inc.	Youngstown, OH
	Accepted Equal	

2.2 MATERIALS

- A. Refer to Section 01 60 00 for basic requirements for products and materials.
- B. Products shall be constructed of the following materials:

ITEM	MATERIAL	SPECIFICATION
Coupling Housings (Match adjacent pipe material)	Ductile Iron	ASTM A536 grade 65-45-12
	Steel	
Lining (couplings 3" and larger)	Fusion-Bonded Epoxy	See Section 09 96 56 AWWA C550 12 -mil minimum DFT Meet NSF 61 for potable water applications
Gaskets	Rubber	As recommended by Manufacturer for fluid conveyed AWWA C606 and ASTM D2000 Meet NSF 61 for potable water applications
Bolts and Nuts (Use same material as flange bolts)	SAE Type 316	
	Stainless Steel	
Exterior Finish Coat	Epoxy Urethane	See Section 09 90 00
Polyethylene Encasement for Buried Couplings and Appurtenances	Polyethylene Sheet	AWWA C105 2 layers, 8 mils each

- C. The following product design criteria, options and accessories are required:

ITEM	DESCRIPTION
Couplings – Grooved and Shouldered Type on DIP Pipe 4"-24" diameter	Minimum wall thickness of radius-grooved grooved DIP shall be Class 53. Pipe walls for flexible-joint couplings shall be radius-grooved to dimensions shown in AWWA C606 Table 2. Pipe walls for rigid-joint couplings shall be radius-grooved to dimensions shown in AWWA C606 Table 3. Cut grooving will not be accepted.
Coating on Buried Bolts and Nuts	See Section 33 11 19.

- D. Internal bore of couplings and joints shall be as close to that of pipe system as is commercially available.
- E. All coupling products referenced in this section shall be painted and coated, interior and exterior in accordance with Sections 09 90 00 and 09 96 56.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Make field measurements needed to install products before submitting shop drawings or ordering. Make minor changes in dimensions and alignments as needed to avoid utilities or structural conflicts.
- B. On buried couplings and assemblies, lubricate all threaded parts including bolts and compression collars before assembling couplings and joints.

3.2 INSTALLATION

- A. Furnish and install couplings at locations shown on Plans and Submittals.
- B. The following installation standards shall be followed:
 - 1. Manufacturer’s installation and warranty requirements
 - 2. Applicable OSHA and Cal OSHA regulations
 - 3. Applicable building, fire, plumbing and mechanical code requirements
- C. Refer variances between above documents and Contract Documents to Owner’s Representative.
- D. Couplings shall be furnished and installed by Contractor at location shown on Plans and Submittals.
- E. Bolting shall be completed as follows:
 - 1. Lubricate bolt threads with graphite and oil.
 - 2. Boltheads and nuts shall rest squarely against metal. Draw boltheads and nuts tight against Work using suitable wrench not less than 15” long or torque wrench set to provide similar torque. Tap bolt heads with hammer while nut is being tightened. After being tightened, nuts shall be locked.
 - 3. Bolts shall extend entirely through nut projecting at least ¼” but not more than ⅜” beyond outside nut face.
- F. Unless otherwise shown, encase all buried couplings and appurtenances with 2 layers of polyethylene wrap.

3.3 FIELD QUALITY CONTROL

- A. Field testing shall include:

ITEM	TEST FOR	TEST STANDARD (ASTM OR OTHER TEST STANDARD)	FREQUENCY	FIRST TEST PAID FOR BY	RETESTS PAID FOR BY
Couplings	Installation & Leakage	Visual inspection of finished installation	1 inspection	Owner	Owner
	Field Performance	Demonstrate compliance to Contract Documents and Manufacturer's printed literature	1 test	Contractor	Contractor
	11-month Warranty Inspection	Demonstrate compliance to Contract Documents and Manufacturer's printed literature	1 test	Owner	Contractor

**** END OF SECTION ****

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**SECTION 33 05 37
WALL PIPES, SEEP RINGS AND PENETRATIONS**

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Materials, testing, and installation of ductile iron, steel and stainless steel wall pipes, sleeves, wall collars, seepage rings and wall penetrations.

1.2 RELATED WORK

- A. Section 01 30 00: Contractor Submittals
- B. Section 01 40 00: Quality Control
- C. Section 01 53 00: Protection of Existing Facilities
- D. Section 01 55 00: Site Access and Storage
- E. Section 01 60 00: Products, Materials, Equipment and Substitutions
- F. Section 03 30 00: Cast-in-Place Concrete
- G. Section 09 90 00: Protective Coatings
- H. Section 33 05 31: Piping Joint Materials

1.3 SYSTEM DESCRIPTION

- A. Furnish and install pipe penetration sleeves, wall pipes, seep rings and rubber hydrostatic annular sealing devices for pipe and conduit penetrations including appurtenant structural, and/or mechanical mountings required for compliance with Manufacturer's installation requirements and compliance with applicable codes and standards.

1.4 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workmen trained and experienced in necessary trades and crafts and completely familiar with specified requirements and methods for proper performance of Work of this section.
- B. Factory testing shall include:

ITEM	TEST FOR	TEST STANDARD (ASTM OR OTHER TEST STANDARD)	FREQUENCY	FIRST TEST PAID FOR BY	RETESTS PAID FOR BY
Fabricated Steel Wall Sleeve or Penetration and Collar Assembly	Pressure Test	Demonstrate water-tight seal between collar and sleeve. Test at 20 psig for 4 hours.	One each size fabricated wall sleeve	Contractor	Contractor

1.5 REFERENCES

- A. API 5L Seamless Line Pipe
- B. ASME/ANSI B31.3 Process Piping
- C. ASME/ANSI B36.10 Welded and Seamless Wrought Steel Pipe

- D. ASTM A53 Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
- E. ASTM A105 Carbon Steel Forgings for Piping Components
- F. ASTM A135 Electric-Resistance-Welded Steel Pipe
- G. ASTM A139 Electric-Fusion (Arc)-Welded Steel Pipe (NPS 4 and Over)
- H. ASTM A181 Carbon Steel Forgings for General-Purpose Piping
- I. ASTM A182 Forged or Rolled Alloy-Steel Pipe Flanges, Forged Fittings and Valves and Parts for High-Temperature Service
- J. ASTM F593 Stainless Steel Bolts, Hex Cap Screws, and Studs
- K. AWS B3.0 Welding Procedure and Performance Qualification

1.6 SUBMITTALS

- A. Furnish the following submittals.

SUBMITTAL	DESCRIPTION	
Shop Drawings	Required per structural shop drawing requirements. Show dimensions and wall thickness. Show proposed coatings including material and thickness.	
Catalog Data	Required per catalog data requirements.	
Installation Instructions	Required per installation instruction requirements for rubber annular hydrostatic sealing devices.	
Foundry or Test Record Transcripts	Submit results of leakage test for cast-iron sleeves having shrink-fit steel collars or collar halves bottomed in groove and steel sleeves having welded steel collars per foundry or test record transcript requirements.	
Warranty	Furnish one-year warranty from date of final acceptance	

- B. Refer to Section 01 30 00 for definition of requirements for shop drawings, catalog data, and installation instructions,

1.7 DELIVERY, STORAGE AND HANDLING

- A. Refer to contract documents for delivery storage and handling requirements.
- B. Manufacturer's instruction and warranty requirements for delivery, storage and handling of wall pipes, seep rings and penetrations shall be strictly followed.

1.8 PAYMENT

- A. Payment for Work in this section shall be included as part of the lump-sum for Bid Item No. 1.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Acceptable Manufacturers include:

ITEM	MANUFACTURER	MANUFACTURER LOCATION
Steel Pipe Penetration Wall Sleeve with Weep Ring	Calpico, Inc.	South San Francisco, CA
	GPT Industries (formerly Pipeline Seal and Insulator, Inc.; PSI) "WS" Steel Wall Sleeve	Houston, TX

ITEM	MANUFACTURER	MANUFACTURER LOCATION
	Proco Products	Stockton, CA
	Accepted equal	

B. Acceptable Manufacturers for rubber annular hydrostatic sealing devices include:

ITEM	MANUFACTURER	MANUFACTURER LOCATION
EPDM Rubber Annular Hydrostatic Sealing Devices	Calpico, Inc. "Pipe Linx"	South San Francisco, CA
	GPT Industries (formerly Pipeline Seal and Insulator, Inc.; PSI) "Link Seal" (Type S-316)	Houston, TX
	Proco Products Pen-Seal	Stockton, CA
	Accepted equal	

2.2 MATERIALS

A. Refer to Section 01 60 00 for basic requirements for products and materials.

B. Wall pipes, seep rings, and penetrations shall be constructed of the following materials:

ITEM	MATERIAL	SPECIFICATION
Fabricated Steel Wall Sleeves Containing Pipe	Steel Pipe	ASTM A53 Type E or S Grade B or ASTM A135 Grade B or ASTM A139 Grade B or API 5L or 5LX Standard Weight Thickness per ANSI B36.10
Fabricated Steel Wall Sleeves Connecting to Steel Pipe	Steel Pipe	Material and thickness to match connecting pipe. Provide ends as shown for connection to adjacent steel pipe
Wall Collar on Steel Wall Sleeve	Steel	ASTM A105, A181 or A182
Painting and Coating of Steel Wall Sleeve	Epoxy	See Section 09 90 00.

C. Rubber annular hydrostatic sealing devices shall be constructed of the following materials:

ITEM	MATERIAL	SPECIFICATION
Pressure Plate	Carbon Steel or Glass Reinforced Plastic Composite	
Bolts and Nuts for Links	Stainless Steel	ASTM F593 SAE Type 316 Rod shall be 1/2" larger in diameter than annular space.
Sealing Element	EPDM Synthetic Rubber (Ethylene-Propylene Diene Monomer)	Black
Painting and Coating		See Section 09 90 00.

D. The following product design criteria, options and accessories are required:

ITEM	DESCRIPTION
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ITEM	DESCRIPTION	
Fabricated Steel Wall Sleeves	Location	Provide for all penetrations of new concrete walls, footings, floors or roofs including those containing rubber annular hydrostatic sealing devices through which piping passes
	Size	Consult with rubber annular seal Manufacturer
Rubber Annular Hydrostatic Sealing Devices	Design	Modular mechanical type, using interlocking synthetic rubber links shaped to continuously fill annular space between pipe sleeve and passing pipe. Assembled links shall form continuous rubber belt around pipe, with pressure plate under each bolt head and nut.
	Minimum Seating Width	4"
Seepage Ring or Wall Flange	Wall Collar	Provide on wall pipes and sleeves penetrating walls which are to be watertight. Cut welded wall collars from steel ring of size shown.
Seepage Ring or Wall Flange	Welding	Weld collar to steel wall pipe or sleeve with full circle fillet welds. Weld per ANSI B31.3, Chapter V.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Make field measurements needed to install wall pipes, seep rings and penetrations before submitting shop drawings or ordering. Make minor changes in dimensions and alignments as needed to avoid utilities or structural conflicts.

3.2 INSTALLATION

- A. Furnish and install wall pipes, seep rings and penetrations at locations shown on Plans and Submittals.
- B. The following installation standards shall be followed:
1. Manufacturer's installation and warranty requirements
 2. Applicable OSHA and Cal OSHA regulations
 3. Applicable building, fire, plumbing, mechanical and electrical code requirements
- C. Refer variances between above documents and Contract Documents to Owner's Representative.
- D. Wall pipes, seep rings and penetrations shall be furnished and installed by Contractor at location shown on Plans and Submittals.
- E. Install wall pipes, seep rings and penetrations to tolerances recommended by Manufacturer. Unless otherwise shown, install wall pipes, seep rings and penetrations true and level using precision gauges and levels.

- F. Provide wall pipe or floor pipe and seals at the following locations:
1. Where explicitly shown on Plans.
 2. Where pipes penetrate concrete walls or slabs below ground or finish floor.
 3. Where pipes penetrate concrete walls or slabs containing water on one or both sides.
 4. Provide floor sleeve wherever plastic pipe, steel or stainless steel pipe 3" and smaller or copper tubing passes through floor or slab. Provide rubber annular sealing device in annular space between sleeve and passing pipe or tubing.
 5. Provide wall sleeves wherever plastic pipe, steel or stainless-steel pipe 3" and smaller, or copper tubing passes through a wall.
 6. Provide one rubber annular seal when wall is 8" thick or less. Provide 2 rubber annular seals (one at each end of sleeve) when wall thickness exceeds 8". Pack annular space with polyethylene foam filler and fill ends of penetration with 2" of elastomeric sealant on both sides of structure.
 7. Where sleeves are installed in which water or soil is on one or both sides of channel or wall, provide 2 rubber annular seals (one at each end of sleeve).
 8. Where pipes pass through walls or slabs and no sleeves or wall or floor pipe with seep ring is provided, pack annular space with polyethylene foam filler and fill ends of penetration with 2" of elastomeric sealant on both sides of structure.
- G. In existing concrete walls and slabs, core drill holes 2" larger in diameter than diameter of wall flange or collar. Align wall sleeve and collar assembly with connecting or passing piping. Pack void space between sleeve and concrete with grout.
- H. In new concrete walls and slabs, install wall pipes in walls before placing concrete. Do not allow any portion of sleeve to touch reinforcing steel. Align wall sleeve and collar assembly with connecting or passing piping.
- I. Install wall pipes having flanged end connections as follows:
1. Check alignment before grouting in place or pouring concrete. Realign if sleeve is not properly aligned.
 2. Install flanged end wall sleeves or penetrations with bolt holes of end flanges straddling horizontal and vertical centerlines of sleeve.
 3. Lubricate flange bolts with oil and graphite prior to installation.
- J. Welder qualifications shall be in accordance with AWS B3.0.
- K. Install rubber annular hydrostatic sealing devices in accordance with Manufacturer's instructions.

3.3 FIELD QUALITY CONTROL

A. Field testing shall include:

ITEM	TEST FOR	TEST STANDARD (ASTM OR OTHER TEST STANDARD)	FREQUENCY	FIRST TEST PAID FOR BY	RETESTS PAID FOR BY
Wall Pipes, Seep Rings and Penetrations	Installation & Leakage	Visual inspection of finished installation	1 inspection	Owner	Owner
		Test hydraulic structure for leakage with wall penetrations in place	1 inspection	Owner	Owner
	Field Performance	Demonstrate compliance to Contract Documents and Manufacturer's printed literature	1 test	Contractor	Contractor
	11-month Warranty Inspection	Demonstrate compliance to Contract Documents and Manufacturer's printed literature	1 test	Owner	Contractor

**** END OF SECTION ****

**SECTION 33 05 38
HANGERS AND SUPPORTS**

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. This section includes materials, testing, and installation of hangers and supports for pipe, ductwork, and conduit.

1.2 RELATED WORK

- A. Section 01 30 00: Contractor Submittals
- B. Section 01 40 00: Quality Control
- C. Section 01 53 00: Protection of Existing Facilities
- D. Section 01 55 00: Site Access and Storage
- E. Section 01 60 00: Products, Materials, Equipment and Substitutions
- F. Section 03 30 00: Cast-in-Place Concrete
- G. Section 05 50 00: Metal Fabrications
- H. Section 09 90 00: Protective Coatings

1.3 SYSTEM DESCRIPTION

- A. Furnish and install complete functional pipe, duct, and conduit hanger and support systems where shown including appurtenant mountings or connections required for compliance with Manufacturer's installation requirements and compliance with applicable building, mechanical, plumbing, and electrical codes and standards.

1.4 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workmen trained and experienced in necessary trades and crafts and completely familiar with specified requirements and methods for proper performance of Work of this section.

1.5 REFERENCES

- A. ASTM A153 Zinc Coating (Hot-Dip) on Iron and Steel Hardware
- B. ASTM A193 Alloy-Steel and Stainless Steel Bolting for High-Temperature or High Pressure Service and Other Special Purpose Applications
- C. ASTM A194 Carbon Steel and Alloy Steel, and Stainless Steel Nuts for Bolts for High-Pressure or High Temperature Service, or Both
- D. ASTM B6 Zinc
- E. ASTM B633 Electrodeposited Coatings of Zinc on Iron and Steel
- F. ASTM D3917 Dimensional Tolerance of Thermosetting Glass-Reinforced Plastic Pultruded Shapes
- G. ASTM D4385 Classifying Visual Defects in Thermosetting Reinforced Plastic Pultruded Products
- H. ASTM E84 Surface Burning Characteristics of Building Materials
- I. ASTM F593 Stainless Steel Bolts, Hex Cap Screws and Studs
- J. ASTM F594 Stainless Steel Nuts
- K. AWS D1.1 Structural Welding Code – Steel
- L. MFMA 1 Metal Framing Standards

- M. MSS SP58 Pipe Hangers and Supports – Materials, Design, Manufacture, Selection, Application, and Installation
- N. MSS SP69 Pipe Hangers and Supports – Selection and Application
- O. California Building Code (CBC)
- P. California Electrical Code (CEC)
- Q. California Mechanical Code (CMC)
- R. California Plumbing Code (CPC)

1.6 SUBMITTALS

- A. Furnish the following submittals.

SUBMITTAL	DESCRIPTION	
Shop Drawings	Required for pipe hangers and supports per structural shop drawing requirements.	
Catalog Data	Required for pipe hangers and supports and metal framing systems per catalog data requirements.	
Warranty	Furnish one-year warranty from date of final acceptance	

- B. Refer to Section 01 30 00 for definition of requirements for shop drawings, catalog data and installation instructions.

1.7 DELIVERY, STORAGE AND HANDLING

- A. Refer to contract documents for delivery storage and handling requirements.
- B. Manufacturer's instruction and warranty requirements for delivery, storage and handling of metal fabrications shall be strictly followed.

1.8 PAYMENT

- A. Payment for Work in this section shall be included as part of the lump-sum for Bid Item No. 1.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Acceptable Manufacturers include:

ITEM	MANUFACTURER	MANUFACTURER LOCATION
Concrete Anchors – Epoxy Adhesive Anchor Systems	Hilti Corp.	Tulsa, OK
	ITW Ramset / Redhead	Wood Dale, IL
	Simpson Strong Tie Co. "Epoxy-Tie"	Pleasanton, CA
	Accepted Equal	
Concrete Anchors – Expansion Bolt Systems	Hilti Corp."Kwik Bolt II"	Tulsa, OK
	ITW Ramset / Redhead	Wood Dale, IL
	Simpson Strong Tie Co. "Wedge-All"	Pleasanton, CA
	Accepted Equal	
Powder Actuated Fastening Systems	Hilti Corp.	Tulsa, OK
	ITW Ramset / Redhead	Wood Dale, IL
	Reynolds Metal Company "ReynoRail II"	Richmond, VA
	Accepted Equal	

ITEM	MANUFACTURER	MANUFACTURER LOCATION
Metal-to-Metal Epoxy	J B Weld	Sulfur Springs, TX
	Accepted Equal	
Plastic Pipe Hangers	Spears Manufacturing Co. "Clic Top"	Sylmar, CA
	Accepted Equal	
Steel and Stainless Steel Pipe and Conduit Hangers	Bergen-Power Pipe Supports, Inc.	Woburn, MA
	Carpenter & Paterson Company "C&P"	Woburn, MA
	Cooper B-Line Inc.	Highland, IL
	Elcen Metal Products Company	Rockville, MD
	Empire Industries, Inc.	Manchester, CT
	Globe Pipe Hanger Products, Inc.	Cleveland, OH
	Grinnell Corporation "Anvil"	Cranston, RI
	Kin-Line Inc. Division Cooper B-Line	Highland, IL
	Michigan Hanger Company, Inc.	Mullica Hill, NJ
	Modern Pipe Supports Corporation	Cleveland, OH
	Persing and Company	Nappanee, IN
	PHD Manufacturing, Inc.	Columbiana, OH
	Powerstrut Div Allied Electrical Group	Harvey, IL
	Superstrut Div American Electric, Thomas & Betts, Inc.	Memphis, TN
	Tripac Inc.	Corona, CA
	Unistrut Corporation	Wayne, MI
	Viking Corporation	Hastings, MI
Wesanco Steel Products, Inc.	La Mirada, CA	
Accepted Equal		
Metal Bolted Framing Strut Systems	Cooper B-Line Inc. Globe-Strut	Corona, CA
	Kindor Div American Electric, FL Industries	Pittsburgh, PA
	Powerstrut Div Allied Electrical Group	Harvey, IL
	Superstrut Div American Electric, Thomas & Betts, Inc.	Memphis, TN
	Tripac Inc.	Corona, CA
	Unistrut Corporation	Wayne, MI
	Wesanco Steel Products, Inc.	La Mirada, CA
Accepted Equal		
Fiberglass Channel Framing Systems	Aikenstrut Division Allied Electrical Group	Harvey, IL
	Champion Fiberglass "Champion Strut"	Spring, TX
	Strut Tech Engineered Support Systems	Redmond, WA
	Unistrut Corporation	Wayne, MI
Accepted Equal		

2.2 MATERIALS

- A. Refer to Section 01 60 00 for basic requirements for products and materials.
- B. Pipe hangers and supports shall be constructed of the following materials:

ITEM	MATERIAL	SPECIFICATION
Bolts (Connection Bolts and Anchor Bolts) – Stainless Steel	Stainless Steel	ASTM A193 Grade B8M bolts with ASTM A194 Grade 8M nuts Alternate ASTM F593 Type 316 bolts with ASTM F594 SAE Type 316 nuts

ITEM	MATERIAL	SPECIFICATION
		Washers – same material as nuts
Bolts – Embedded Eyebolts	Stainless Steel	SAE Type 316 Welded eye type
Concrete Anchors – Epoxy Adhesive Anchor Systems	Stainless Steel	SAE Type 316
Concrete Anchors – Expansion Bolt Systems	Stainless Steel	SAE Type 316
Powder Actuated Fastening Systems	Steel	AISI 1061 Hardness 52-58 Rockwell C
	Galvanized Coating	ASTM B633 - 2.1 mil thickness - 1.30 ounce/ft ²
Fiberglass Channel Framing System	Fiber-Reinforced Plastic	Flame-spread rating of 25 or less per ASTM #84 Dimensional Tolerance per ASTM D3917 and D4385 with Ultraviolet Stabilizer
Pipe and Conduit Hangers (Above Ground)	Steel	
	Galvanized Coating	ASTM A153 - 2.1 mil thickness - 1.30 ounce/ft ²
Pipe and Conduit Hangers (Below Ground or Exposed to Water)	Stainless Steel	SAE Type 316
	Fiberglass	
Washers	Carbon steel – Galvanized	Square or rectangular smooth beveled washers, tapered in thickness
	Galvanized Coating	ASTM A153 - 2.1 mil thickness - 1.30 ounce/ft ²
Welding Electrode – Steel	Steel Electrodes	AWS D1.1 E70xx except E7024 rods or electrodes shall not be used
Welding Electrode – Stainless Steel	Steel Electrodes	Type 347

C. The following product design criteria, options and accessories are required:

ITEM	DESCRIPTION
Pipe and Conduit Hangers	Maximum horizontal spacing per California Plumbing Code Table 3-1 and 3-2 or Engineered Calculations except where stricter requirements are shown in Contract Documents.

D. Unless otherwise shown, pipe support hanger rod sizes on horizontal pipe shall be as follows:

PIPE DIAMETER	1/2" and less	3/4"	1"	1 1/4"	1 1/2"	2"	3"	4"	5"-8"	10" and up
Hanger Rod Diameter	3/8"							1/2"	5/8"	

E. Unless otherwise shown, pipe support spacing on horizontal pipe shall be as follows:

PIPE MATERIAL	PIPE DIAMETER									
	1/2" and less	3/4"	1"	1 1/4"	1 1/2"	2"	3"	4"	5"-8"	10" and up

Cast-Iron Hubless Pipe Shielded Coupling Joints	Every other joint unless over 4' If over 4', support each joint		
Copper Tube and Pipe, Soldered or Brazed Joints	6" maximum spacing		8' maximum spacing
Ductile Iron Pipe	6' maximum spacing		8' maximum spacing
Steel and Brass Water or DWV Pipe Threaded or Welded Joints	10' maximum spacing	12' maximum spacing	
Steel, Brass and Tinned Copper Gas Pipe Threaded or Welded Joints	6' max spacing	8' maximum spacing	10' maximum spacing
Schedule 40 and Schedule 80 PVC and ABS DWV Solvent Cemented Joints (gravity flow)	4' maximum spacing Provide for expansion every 30'		
Schedule 40 and Schedule 80 PVC and ABS DWV Solvent Cemented Joints Under Pressure	3' maximum spacing Provide for expansion every 30'	4' maximum spacing Provide for expansion every 30'	
CPVC Solvent Cemented Joints	3' maximum spacing Provide for expansion every 30'	4' maximum spacing Provide for expansion every 30'	
PEX Metal Insert and Metal Compression Joints	32" maximum spacing		
PEX-AL-PEX or PE-AL-PE Metal Insert and Metal Compression Joints	98" maximum spacing		

F. Unless otherwise shown, pipe support spacing on vertical pipe shall be as follows:

PIPE MATERIAL	PIPE DIAMETER									
	½" and less	¾"	1"	1¼"	1½"	2"	3"	4"	5"-8"	10" and up
Cast-Iron Hubless Pipe Shielded Coupling Joints	Base and each floor not to exceed 15'									
Copper Tube and Pipe, Soldered or Brazed Joints	Each floor not to exceed 10'									
Ductile Iron Pipe	Each floor not to exceed 10'									
Steel and Brass Water or DWV Pipe Threaded or Welded Joints	Every other floor not to exceed 25'									
Steel, Brass and Tinned Copper Gas Pipe Threaded or Welded Joints	6' max spacing	8' maximum spacing	Each floor not to exceed 10'							
Schedule 40 and Schedule 80 PVC and ABS DWV Solvent Cemented Joints	Base and each floor. Provide mid-story guides Provide for expansion every 30'									
CPVC Solvent Cemented Joints	Base and each floor. Provide mid-story guides									
PEX Metal Insert and Metal Compression Joints	Base and each floor. Provide mid-story guides									
PEX-AL-PEX or PE-AL-PE Metal Insert and Metal Compression Joints	Base and each floor. Provide mid-story guides									

- G. Zinc coatings shall be applied by hot-dipped or electro-depositing process. Zinc shall comply with ASTM B6.
- H. Before leaving shop, all steel not shown or specified to be galvanized or stainless shall receive one coat of pigmented primer recommended by Manufacturer of final

paint system. Parts inaccessible after assembly shall receive second coat of same primer. Final painting shall be as specified in Section 09 90 00.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Make field measurements needed to fabricate and install pipe hangers and supports before submitting shop drawings or ordering. Make minor changes in dimensions and alignments as needed to avoid utilities or structural conflicts.
- B. Clean surfaces of metalwork to be in contact with concrete, removing all rust, dirt, grease and other foreign substances before concrete is placed.
- C. All embedded metalwork shall be secured accurately in position when concrete is placed to prevent displacement or undue vibration during or after placement of concrete.

3.2 INSTALLATION

- A. Furnish and install hangers and supports at locations shown on Plans and Submittals.
- B. The following installation standards shall be followed:
 - 1. Manufacturer's installation and warranty requirements
 - 2. Applicable OSHA and Cal OSHA regulations
 - 3. Applicable building, fire, plumbing, mechanical and electrical code requirements
- C. Refer variances between Manufacturer's installation instructions and Contract Documents to Owner's Representative.

3.3 FIELD QUALITY CONTROL

- A. Field testing shall include:

ITEM	TEST FOR	TEST STANDARD (ASTM OR OTHER TEST STANDARD)	FREQUENCY	FIRST TEST PAID FOR BY	RETESTS PAID FOR BY
Pipe Hangers and Supports	Support Spacing	California Plumbing Code Table 3-1 and 3-2 and tables herein	All hangers and supports	Owner	Contractor
	Snug Fit and Near-Equal Distribution of Load among Supports	Visual inspection	All hangers and supports	Owner	Owner
	11-month	Demonstrate	1 test	Owner	Contractor

ITEM	TEST FOR	TEST STANDARD (ASTM OR OTHER TEST STANDARD)	FREQUENCY	FIRST TEST PAID FOR BY	RETESTS PAID FOR BY
	Warranty Inspection	compliance to Contract Documents and Manufacturer's printed literature			

** END OF SECTION **

**SECTION 33 08 11
PRESSURE TESTING**

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Field pressure testing of all new pipelines and related new construction/modification of existing pipelines, intended for conveyance of wastewater under pressure. This pertains to:
 - 1. New 10-inch diameter suction piping for Pumps #1 and #2
 - 2. New 10-inch diameter discharge piping for Pumps #1 and #2
 - 3. Modified 16-inch diameter discharge header piping (inside the Pump Room)
 - 4. New 8-inch diameter force main drain piping (inside the Pump Room)
 - 5. New bypass pumping piping (outside the pump station) that is connected to the existing 16-inch diameter force main.
 - 6. Temporary piping associated with bypass pumping at the lift station.
- B. Test all pipelines for water-tightness by subjecting each section to Hydrostatic Pressure and Leakage Tests in accordance with applicable requirements of AWWA C600 or C605, except as modified herein.
- C. Plan construction activities to allow and facilitate testing of all sections of applicable pipelines.
- D. Obtain all permits required to complete Work specified herein.

1.2 RELATED WORK

- A. Section 01 30 00: Contractor Submittals
- B. Section 01 40 00: Quality Control
- C. Section 01 53 00: Protection of Existing Facilities
- D. Section 01 55 00: Site Access and Storage
- E. Section 01 60 00: Products, Materials, Equipment and Substitutions

1.3 SYSTEM DESCRIPTION

- A. Pressure test pipe to AWWA and Contract Document standards.

1.4 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workmen trained and experienced in necessary trades and crafts and completely familiar with specified requirements and methods for proper performance of Work of this section.

1.5 REFERENCES

- A. AWWA C600 Installation of Ductile Iron Water Mains and their Appurtenances
- B. AWWA C604 Installation of Buried Steel Water Pipe—4" and Larger
- C. AWWA C605 Underground Installation of Polyvinyl Chloride (PVC) Pressure Pipe and Fittings for Water

- D. National Pollutant Discharge Elimination System Permit (NPDES) —for City of San Diego (including any amendments)
- E. Standard Methods for Examination of Water and Wastewater

1.6 SUBMITTALS

- A. Furnish the following submittals.

SUBMITTAL	DESCRIPTION
Testing Plan	Submit detailed plan showing how Contractor intends to test pipeline.

- B. Refer to Section 01 30 00 for definition of requirements for reports and certificates of compliance.

1.7 DELIVERY, STORAGE AND HANDLING

- A. Refer to contract documents for delivery storage and handling requirements.

1.8 PAYMENT

- A. Payment for Work in this section shall be included as part of the lump-sum for Bid Item No. 1.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Furnish all labor, water, and equipment necessary to complete pressure testing process.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Apply test pressures at approved outlet or fitting located within elevation of 5-feet of lowest point of each pipe section to be tested. Provide and later securely plug such fittings. Where air valves or other suitable outlets are unavailable, provide approved taps and fittings for air release, and securely plug these later.

3.2 FIELD QUALITY CONTROL

- A. Field testing shall include:

ITEM	TEST FOR	TEST STANDARD (ASTM OR OTHER TEST STANDARD)	FREQUENCY	FIRST TEST PAID FOR BY	RETESTS PAID FOR BY
Pipe	4-hour Hydrostatic Pressure Test	AWWA C600 or C605 as amplified below	All pipe sections	Contractor (Owner's Representative will observe and record results)	Contractor (Owner's Representative will observe and record results)
	Installation &	Visual inspection of	1 inspection	Owner	Owner

ITEM	TEST FOR	TEST STANDARD (ASTM OR OTHER TEST STANDARD)	FREQUENCY	FIRST TEST PAID FOR BY	RETESTS PAID FOR BY
	Leakage	finished installation			

B. Allowable leakage shall be as follows:

1. No ductile iron or PVC pipe installation will be accepted if leakage exceeds that determined by the following formula (taken from AWWA C600 or AWWA C605):

$$L = (SD\sqrt{P}) / 148,000$$

in which L = allowable leakage, in gallons per hour

S = length of pipe tested, in feet

D = nominal diameter of pipe, in inches

P = average observed test pressure of pipe being tested, as shown, in pounds per square inch gauge, based on elevation of lowest point in line or section under test and corrected to elevation of test gauge.

2. No gasketed steel pipe installation will be accepted if leakage exceeds that determined by the following formula (taken from AWWA C604):

$$L=10 \text{ gallons per inch-diameter per mile of pipe per 24 hours}$$

3. When testing against closed valves, an allowance of 0.0078 gallons per hour per inch of nominal valve size may be added to that computed using formulas above to account for leakage around seals.

C. For welded steel pipe, no leakage will be permitted.

D. For polyethylene pipe, no leakage will be permitted.

E. Four-hour hydrostatic pressure test shall proceed as follows:

1. After all pipe, appurtenances and permanent thrust blocks have been installed and backfilled sufficiently and temporary plugs, caps, thrust blocks and shoring have been installed for required restraint, they shall be subjected to a hydrostatic pressure test.
2. Test pressure shall be 50 psi in excess of working pressure shown for class of pipe unless test pressure is shown elsewhere in Contract Documents.
3. Conduct pressure tests or retests subsequent to any trench backfill compactive effort that might be performed with heavy duty compacting equipment having overall weight in excess of 100 pounds.
4. Some equipment such as butterfly valves may have maximum working water pressure less than test pressure. Contractor shall apply a minimum back pressure on these closed devices equal to difference between test pressure and rated pressure of device.

5. Complete and pass test prior to connecting any new line with existing pipe and mains. Test shall further be conducted with valves open, and open ends of pipes, valves, and fittings suitably closed. Operate and check valves prior to test period. No leakage shall be allowed when testing across any valves.
6. Maximum length of pipe to be included in any one test shall not exceed 2,500-feet or distance between valves, whichever is greater. Provide suitable test bulkheads, blocking, and fittings to permit such sectionalizing.
7. Fill line slowly and maintain at operating pressure for at least 24 hours prior to testing to satisfy any system water absorption. While filling and immediately prior to testing, expel all air from pipeline.
8. Pump pressure in pipeline to specified test pressure following 24-hour soak period. When test pressure has been reached, discontinue pumping until line pressure has dropped 10-psi, at which time line pressure shall again be pumped up to test pressure. Repeat procedure until 4 hours have elapsed from time test pressure was first applied. At end of this period, pump pressure up to test pressure for last time.
9. Leakage shall be computed as total quantity of water pumped into pipeline during test period, including water added to reach specified test pressure for final time. Leakage shall not exceed rate specified for type of pipe tested.
10. Allowable leakage is based on AWWA formulas specific to pipe materials tested. These formulas appear in respective AWWA publications for each type of pressure pipe.
11. Repeat testing until leakage does not exceed specified leakage rate. Repair all visible leaks regardless of amount of leakage.
12. Complete tests in presence of Owner's Representative. Owner's Representative will record results.

** END OF SECTION **

**SECTION 33 12 00
VALVES, GENERAL**

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. The WORK of this Section includes providing general requirements for valves including installing, adjusting, and testing of valves and where buried valves are indicated, valve boxes to grade, with covers, stem extensions, and position indicators.

1.2 RELATED SECTIONS

- A. Section 01 30 00: Contractor Submittals
- B. Section 01 40 00: Quality Control
- C. Section 01 53 00: Protection of Existing Facilities
- D. Section 01 55 00: Site Access and Storage
- E. Section 01 60 00: Products, Materials, Equipment and Substitutions
- F. Section 09 90 00: Protective Coatings
- G. Section 33 12 12: Resilient-Wedge Gate Valves
- H. Section 33 12 16: Plug Valves
- I. Section 33 12 18: Check Valves

1.3 STANDARD SPECIFICATIONS

- A. Except as otherwise indicated in this Section of the Specifications, the CONTRACTOR shall comply with the 2015 Standard Specifications for Public Works Construction (SSPWC) Greenbook/Whitebook, as specified in Specification Section 01 09 00-1.2(E).

1.4 SPECIFICATIONS AND STANDARDS

- A. Except as otherwise indicated, the current editions of the following standards apply to the WORK of this Section:
 - 1. ANSI B16.1 Gray Iron Pipe Flanges and Flanged Fittings, Classes 25, 125, and 250
 - 2. ANSI B16.5 Pipe Flanges and Flanged Fittings: NPS ½ through NPS 24
 - 3. ANSI/ASME B1.20.1 Pipe Threads: General Purpose (Inch)
 - 4. ANSI/ASME B31.1 Power Piping
 - 5. ASTM A36 Specification for Carbon Structural Steel
 - 6. ASTM A48 Specification for Gray Iron Castings
 - 7. ASTM A126 Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings
 - 8. ASTM A536 Specification for Ductile Iron Castings
 - 9. ASTM B61 Specification for Steam or Valve Bronze Castings

10. ASTM B62 Specification for Composition Bronze or Ounce Metal Castings
11. ASTM B148 Specification for Aluminum-Bronze Castings
12. ASTM B584 Specification for Copper Alloy Sand Castings for General Applications
13. ANSI/AWWA C500 Metal-Seated Gate Valves for Water Supply Service
14. ANSI/AWWA C509 Resilient-Seated Gate Valves for Water-Supply Service
15. AWWA C550 Protective Epoxy Interior Coatings for Valves and Hydrants
16. SSPC-SP-2 Hand Tool Cleaning
17. SSPC-SP-5 White Metal Wet Abrasive Blast Cleaning

1.5 SHOP DRAWINGS AND SAMPLES

- A. The following shall be submitted in compliance with Section 01 30 00:
 1. Manufacturer's product data including catalogue cuts.
 2. Manufacturer's installation instructions.
 3. Shop drawings showing details and dimensions.
 4. Manufacturer's certification that products comply with the indicated requirements.
 5. Schedule of valves indicating valve identification and location.
 6. Manufacturer's certification that epoxy coatings have been factory tested and comply with the indicated requirements.

1.6 OWNER'S MANUAL

- A. The following shall be included in the OWNER'S MANUAL in compliance with Section 01 30 00:
 1. Manufacturer's installation and operating instructions.
 2. Manufacturer's maintenance procedures.
 3. List of special tools.
 4. Schedule of valves indicating valve identification and location.

1.7 FACTORY TESTING

- A. General: Valves shall be tested in compliance with the AWWA Standards as

indicated. Except as otherwise indicated, each valve body shall be tested under a test pressure equal to twice its design water-working pressure.

- B. Proof-of-Design Tests: The CONTRACTOR shall furnish the RESIDENT ENGINEER three (3) certified copies of a report from an independent testing laboratory certifying successful completion of proof-of-design testing for all valves of sizes 10-inch and larger unless indicated otherwise in the specific valve Section. In lieu of testing the valves at an independent testing laboratory, proof-of-design testing may be performed at the valve manufacturer's laboratory, but must be witnessed by a representative of a qualified independent testing laboratory representative. Proof-of-design testing shall have been performed on not less than three valves, with all three units demonstrating full compliance with the test standards. Failure to satisfactorily complete the test shall be deemed sufficient evidence to reject all valves of the proposed make or manufacturer's model number.

1.8 FIELD TESTING

- A. Testing: Valves shall be field-tested for compliance with the indicated requirements.

PART 2 - PRODUCTS

2.1 VALVES

- A. General: Shut-off valves, 6-inch and larger, shall have operators with position indicators. Where buried, these valves shall be designed for buried service and provided with valve boxes and covers containing position indicators, and valve extensions. Valves mounted higher than 7 feet above working level shall be provided with chain operators.
- B. Valve Flanges: The flanges of valves shall comply with ANSI B16.1 (for cast iron flanges), ANSI B16.42 (for ductile iron flanges), or ANSI B16.5 (for steel flanges); as appropriate per the technical specification for each type of valve. Flange class shall be as indicated on the design drawings or as otherwise required by the pressure rating for the attached piping system. Flanges shall be flat-faced unless otherwise specified or indicated to be raised face.
- C. Gate Valve Stems: Where dezincification is indicated, gate valve stems shall be fabricated with bronze conforming to ASTM B 62, containing not more than 5 percent of zinc nor more than 2 percent of aluminum. Gate valve stems shall be designed for minimum tensile strength of 60,000 psi, a minimum yield strength of 40,000 psi, and an elongation of at least 10 percent in 2 inches, as determined by a test coupon poured from the same ladle from which the valve stems are poured. Where dezincification is not indicated, bronze conforming to ASTM B 584 may be used.
- D. Protective Coating: Except where otherwise indicated, ferrous surfaces, exclusive of stainless steel surfaces, in the water passages of all valves 4-inch and larger, and exterior surfaces shall be fusion bonded epoxy coated conforming to Section 09800. Flange faces of valves shall not be epoxy coated.
- E. Valve Operators: Where indicated, valves shall include electric operators recommended by the manufacturer. Operators of the same type shall be furnished by the same manufacturer. Valve operators, regardless of type, shall be installed, adjusted, and tested by the valve manufacturer at the manufacturing plant.
- F. Nuts and Bolts: Nuts and bolts on valve flanges, bodies and supports shall comply

with Section 05500.

2.2 NAMEPLATES, TOOLS AND SPARE PARTS

- A. Nameplates: Except as otherwise indicated, a label shall be provided on all valves exclusive of hose bibbs and chlorine cylinder valves. The label shall be 1/16-inch plastic or stainless steel, minimum 2 inches by 4 inches in size, and shall be permanently attached to the valve.
- B. Spare Parts: Two sets of packings, O-rings, gaskets, discs, seats, and bushings shall be furnished with each valve, as applicable.

PART 3 - EXECUTION

3.1 VALVE INSTALLATION

- A. General: Valves, operating units, stem extensions, valve boxes, and accessories shall be installed in accordance with the manufacturer's installation instructions. Valves shall be independently supported to prevent stresses on the pipe.
- B. Access: Valves shall be installed to provide easy access for operation, removal, and maintenance and to prevent interferences between valve operators and structural members or handrails.
- C. Valve Accessories: Where combinations of valves, sensors, switches, and controls are indicated, the combinations shall be properly assembled and installed to ensure that systems are compatible and operating properly.

**** END OF SECTION ****

**SECTION 33 12 02
MANUAL VALVE OPERATORS**

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. The WORK of this Section includes providing all shut off and throttling valves with manual and power operators as indicated. The CONTRACTOR shall provide the valve and gate operators, complete and operable, including all controls, motors, gears, enclosures, and other necessary appurtenances as indicated.
- B. The WORK also requires that the valve or gate manufacturer accept responsibility for furnishing the WORK in this Section but without altering or modifying the CONTRACTOR'S responsibilities under the Contract Documents.
- C. The WORK additionally requires that the one manufacturer who accepts the indicated responsibilities shall manufacture the valve or gate, as a minimum.
- D. The WORK also includes coordination of design, assembly, testing and installation.

1.2 RELATED WORK

- A. Section 01 30 00: Contractor Submittals
- B. Section 01 40 00: Quality Control
- C. Section 01 53 00: Protection of Existing Facilities
- D. Section 01 55 00: Site Access and Storage
- E. Section 01 60 00: Products, Materials, Equipment and Substitutions
- F. Section 09 90 00: Protective Coatings
- G. Section 33 12 12: Resilient-Wedge Gate Valves
- H. Section 33 12 16: Plug Valves

1.3 STANDARD SPECIFICATIONS

- A. Except as otherwise indicated in this Section of the Specifications, the CONTRACTOR shall comply with the 2015 Standard Specifications for Public Works Construction (SSPWC) Greenbook/Whitebook, as specified in Specification Section 01 09 00-1.2(E).

1.4 SUBMITTALS

- A. Include submittals for manual valve operators in submittals for valves to which they are attached.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Refer to contract documents for delivery storage and handling requirements.
- B. Manufacturer's instruction and warranty requirements for delivery, storage and handling of manual valve operators shall be strictly followed.

1.6 PAYMENT

- A. Payment for Work in this section shall be included as part of the lump-sum for Bid Item No. 1.

PART 2 - PRODUCTS

2.1 GENERAL

- A. General: Unless otherwise indicated, all shut-off and throttling valves, and externally-actuated valves and gates, shall be provided with manual operators. The CONTRACTOR shall furnish all operators complete and operable with mounting hardware, gears, handwheels, levers, chains, and extensions, as applicable. All operators shall be capable of holding the valve in any intermediate position between fully-open and fully-closed without creeping or fluttering.
- B. Manufacturers: Where indicated, certain valves and gates may be provided with operators manufactured by the valve or gate Manufacturer. Where operators are furnished by different manufacturers, the CONTRACTOR shall coordinate selection to have the fewest number of manufacturers possible.
- C. Materials: All operators shall be current models of the best commercial quality materials and liberally-sized for the maximum expected torque. All materials shall be suitable for the environment in which the valve or gate is to be installed.
- D. Mounting: All operators shall be securely mounted by means of brackets or hardware specially designed and sized for this purpose and of ample strength. The word "open" shall be cast on each valve or operator with an arrow indicating the direction to open in the counter-clockwise direction. All gear and power operators shall be equipped with position indicators. Where possible, manual operators shall be located between 48 and 60 inches above the floor or a permanent work platform.
- E. Standard: Unless otherwise indicated and where applicable, all operators shall be in accordance with ANSI/AWWA C 540 - AWWA Standard for Power-Actuating Devices for Valves and Sluice Gates.

2.2 MANUAL OPERATORS

- A. General: Unless otherwise indicated, all valves and gates shall be furnished with manual operators. Valves in sizes up to and including 32 inches shall have direct acting lever or handwheel operators of the Manufacturer's best standard design. Larger valves and gates shall have gear-assisted manual operators, with an operating pull of maximum 60 pounds on the rim of the handwheel. All buried and submerged gear-assisted valves, all gates, all gear-assisted valves for pressures higher than 250 psi, all valves 30 inches in diameter and larger, and where so indicated, shall have worm-gear operators, hermetically-sealed and grease-packed, where buried or submerged. All other valves 4 inches to 24 inches in diameter may have traveling-nut operators.
- B. Buried Valves: Unless otherwise indicated, all buried valves shall have extension stems to grade, with wrench nuts located within 6 inches of the valve box cover, position indicators, and cast-iron or steel pipe extensions with heavy valve boxes with

stay-put, hot-dip galvanized covers, and operating keys. Where so indicated, buried valves shall be in cast-iron, concrete, or similar valve boxes with covers of ample size to allow operation of the valve operators. Covers of valve boxes shall be permanently labeled as requested by the local Utility Company or the ENGINEER. Wrench-nuts shall comply with AWWA C 500 -Metal Seated Gate Valves for Water Supply Service, and a minimum of 2 operating keys, or one key per 10 valves, whichever is greater, shall be furnished.

- C. Floor Boxes: Hot-dip galvanized cast-iron or steel floor boxes and covers to fit the slab thickness shall be provided for all operating nuts in or below concrete slabs. For operating nuts in the concrete slab, the cover shall be bronze-bushed.
- D. Adjustable Shaft Valve Boxes: Adjustable shaft valve boxes shall be concrete or cast iron valve extension boxes. Box covers on water lines shall be impressed with the letter "W". Gas line covers shall be impressed with the letter "G".
- E. Traveling-Nut Operator: The operator shall consist of a traveling-nut with screw (Scotch yoke) contained in a weather-proof cast-iron or steel housing with spur gear and minimum 12-inch diameter handwheel. The screw shall run in 2 end bearings, and the operator shall be self-locking to maintain the valve position under any flow condition. The screw and gear shall be of hardened alloy steel or stainless steel, and the nut and bushings shall be of alloy bronze. The bearings and gear shall be grease-lubricated by means of grease nipples. All gearing shall be designed for a 100 percent overload.

2.3 MANUFACTURERS

- A. Products shall be from the following manufacturers, or equal.
 - 1. Valve Boxes:
 - Brooks 3RT
 - Christie G5
 - 2. Valve Actuator: Per valve manufacturer's recommendation (for compliance with contract requirements).

PART 3 - EXECUTION

3.1 PREPARATION

- A. Install valves and equipment so as to be easy to operate and service. Where geometry of manufactured valves and equipment and field conditions make it difficult or impossible for average workers to operate or service installed valve or piece of equipment, notify Owner's Representative of conflict before installing valve or item of equipment.
- B. Installation shall be as specified herein. Valve operators shall be located so that they are readily accessible for operation and maintenance. Valve operators shall be mounted for unobstructed access, but mounting shall not obstruct walkways. Valve operators shall not be mounted where shock or vibration will impair their operation. Support systems shall not be attached to handrails, process piping, or mechanical equipment.

3.2 INSTALLATION

- A. Furnish and install valve operators on valves at locations shown on Plans and Submittals.
- B. The following installation standards shall be followed:
 - 1. Manufacturer's installation and warranty requirements
 - 2. Applicable OSHA and Cal OSHA regulations
 - 3. Other applicable building, fire, plumbing, mechanical and electrical code requirements
- C. Install operators and extensions to tolerances recommended by Manufacturer. Unless otherwise shown, install manual valve operators true, plumb, and level using precision gauges and levels.

3.3 SERVICES OF MANUFACTURER

- A. Field Adjustments
 - 1. Field representatives of manufacturers of valves or gates shall adjust their equipment in the field as needed for the required function.

3.4 INSTALLATION

- A. All valve and gate operators and accessories shall be installed in accordance with Section 33 12 00 - Valves, General.

**** END OF SECTION ****

**SECTION 33 12 12
RESILIENT-WEDGE GATE VALVES**

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. The WORK of this Section includes providing solid wedge, manually operated, fusion bonded epoxy lined/coated gate valves.

1.2 RELATED SECTIONS

- A. The WORK of the following Section applies to the WORK of this Section. Other Sections of the Specifications, not referenced below, shall also apply to the extent required for proper performance of this WORK.

- 1. Section 33 12 00: Valves, General
- 2. Section 33 12 02: Manual Valve Operators

1.3 STANDARD SPECIFICATIONS

- A. Except as otherwise indicated in this Section of the Specifications, the CONTRACTOR shall comply with the 2015 Standard Specifications for Public Works Construction (SSPWC) Greenbook/Whitebook, as specified in Specification Section 01 09 00-1.2(E).

1.4 SUBMITTALS

- A. Furnish the following submittals.

SUBMITTAL	DESCRIPTION	
Shop Drawings	Required per valve shop drawing requirements.	
Catalog Data	Required per catalog data requirements.	
	Show lining and coating data and thicknesses.	
Installation Instructions	Required per installation instruction requirements.	
O & M Instructions	Required per operation and maintenance instruction requirements.	
Certificate of Compliance	Submit certified test results for proof of design, hydrostatic and leakage tests.	
	Submit certified report of testing of factory-applied linings	
Warranty	Furnish one-year warranty from date of final acceptance	

- B. Refer to Section 01 30 00 for definition of requirements for shop drawings, catalog data, installation instructions, O&M instructions, and certificates of compliance.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Refer to contract documents for delivery, storage, and handling requirements.
- B. Manufacturer's instruction and warranty requirements for delivery, storage and handling of valves shall be strictly followed.
- C. Actuator and valve shall be shipped and delivered to jobsite as unit.

1.6 PAYMENT

- A. Payment for Work in this section shall be included as part of the lump-sum for Bid Item No. 1.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Gate valves shall be of the rising stem, manually operated type, except where space restrictions require a non-rising stem. Valves shall be constructed of ASTM A48 Ductile Iron. Valves shall be Class 125 with flanged ends. Valve shall be of the solid wedge type. All valves shall be the product of one manufacturer and shall fully comply with AWWA C 509. Valve shaft shall be stainless steel or low zinc bronze alloy.
- B. Flanges: Valve flanges shall be Class 125, flat-faced conforming to ANSI B16.1.
- C. Bonnet: Valve shall have bolted bonnet with bearings designed to withstand all loads for the operating conditions.
- D. Operator: Valves shall be equipped with handwheel operators capable of operation with a maximum applied force of 40-lbs. CONTRACTOR shall provide any additional gearing required. Buried valves shall be provided with 2-inch square operating nut extended to no less than two feet below the finished grade, within a valve box.
- E. Hardware: All body, flange, and bonnet bolts shall be Type 316 stainless steel.
- F. Lining/Coating: Ferrous surfaces of the valves shall be fusion bonded epoxy lined/coated, conforming to Section 09 80 00 and Section 09 96 56.

2.2 GATE VALVES (SMALLER THAN 3-INCH)

- A. Construction: Gate valves, smaller than 3 inches, shall be heavy duty type for industrial service, with threaded or soldered ends. The bodies shall have threaded tops or union bonnets, fabricated of bronze conforming to ASTM B-62, with bronze stems, solid wedges, metal handwheels, and Teflon-impregnated packing. Buried valves shall have non-rising stems. Exposed valves (above ground) shall have rising stems. Valves shall have a minimum pressure rating of 125 psi steam, or 200 psi coldwater except as otherwise indicated.

2.3 MANUFACTURERS

- A. Products of the type or size indicated shall be manufactured by one of the following (or equal):
 - 1. Solid-wedge gate valves (2-inch and larger):

Refer to City of San Diego Approved Materials List (Water Distribution) for approved valve manufacturers.
 - 2. Gate valves (smaller than 2-inch)

Crane Company

Milwaukee Valve Company
Wm. Powell Company
Stockham Valves and Fittings

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Gate valves shall be installed in accordance with Section 33 12 00.

**** END OF SECTION ****

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**SECTION 33 12 16
PLUG VALVES**

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Materials, testing, and installation of non-lubricated, rectangular port plug valves. Port opening shall provide an area equal to 100% of area of connecting pipe.

1.2 RELATED WORK

- A. Section 01 30 00: Contractor Submittals
- B. Section 01 40 00: Quality Control
- C. Section 01 53 00: Protection of Existing Facilities
- D. Section 01 55 00: Site Access and Storage
- E. Section 01 60 00: Products, Materials, Equipment and Substitutions
- F. Section 09 90 00: Protective Coatings
- G. Section 09 96 56: Epoxy Linings and Coatings
- H. Section 33 05 31: Piping Joint Materials
- I. Section 33 08 11: Pressure Testing
- J. Section 33 12 02: Manual Valve Operators

1.3 SYSTEM DESCRIPTION

- A. Furnish and install complete operating valves including appurtenant mountings or connections required for compliance with Manufacturer's installation requirements and compliance with applicable standards.
- B. Valves shall provide positive shutoff when valve or port is in closed position and shall permit unobstructed flow when valve or port is in open position.
- C. Valves shall seat drip tight against seating pressure equal to rated design pressure of valve.

1.4 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workmen trained and experienced in necessary trades and crafts and completely familiar with specified requirements and methods for proper performance of Work of this section.
- B. Factory testing shall include:

ITEM	TEST FOR	TEST STANDARD (ASTM OR OTHER TEST STANDARD)	FREQUENCY	FIRST TEST PAID FOR BY	RETESTS PAID FOR BY
Resilient-Seated Cast Iron Eccentric	Shell Test	AWWA C517 Section 5.2.1.1	1 each valve	Contractor	Contractor
	Seat Test	AWWA C517 Section 5.2.1.2	1 each valve	Contractor	Contractor

ITEM	TEST FOR	TEST STANDARD (ASTM OR OTHER TEST STANDARD)	FREQUENCY	FIRST TEST PAID FOR BY	RETESTS PAID FOR BY
Plug Valve	Proof of Design	AWWA C517 Section 5.2.2	1 each prototype	Contractor	Contractor
Interior Lining	Holidays and Lining Thickness	See Section 09 96 56	1 each valve	Contractor	Contractor

1.5 REFERENCES

- A. API/ANSI 598 Valve Inspection and Testing
- B. API/ANSI 599 Metal Plug Valves – Flanged, Threaded and Welding Ends
- C. ASME/ANSI B16.1 Gray Iron Pipe Flanges and Flanged Fittings – Classes 25, 125, and 250
- D. ASME/ANSI B16.5 Pipe Flanges and Flanged Fittings: NPS 1/2 through NPS 24
- E. ASME/ANSI B16.10 Face-to-Face and End-to-End Dimensions of Valves
- F. ASME/ANSI B16.42 Ductile Iron Flanged Fittings – Classes 150 and 300
- G. ASME/ANSI B16.47 Large Diameter Steel Flanges: NPS 26 Through NPS 60
- H. ASTM A48 Specification for Gray Iron Castings
- I. ASTM A126 Specification for Gray Iron Castings for Valves, Flanges and Pipe Fittings
- J. ASTM A193 Specification Alloy Steel and Stainless Steel Bolting Materials for High-Temperature or High Pressure Service and Other Special Purpose Applications
- K. ASTM A194 Specification for Carbon Steel, Alloy Steel, and Stainless Steel Nuts for Bolts for High Pressure or High Temperature Service, or Both
- L. ASTM A217 Steel Castings, Martensitic Stainless and Alloy, for Pressure-Containing Parts, Suitable for High-Temperature Service
- M. ASTM A536 Ductile Iron Castings
- N. ASTM A743 Castings, Iron-Chromium, Iron Chromium Nickel, Corrosion Resistant for General Application
- O. AWWA C207 Steel Pipe Flanges for Waterworks Service—Sizes 4" through 144"
- P. AWWA C213 Fusion-Bonded Epoxy Coating for the Interior and Exterior of Steel Water Pipelines
- Q. AWWA C517 Resilient-Seated Cast-Iron Eccentric Plug Valves
- R. AWWA C540 Power-Actuating Devices for Valves and Sluice Gates
- S. AWWA C550 Protective Interior Coatings for Valves and Hydrants
- T. AWWA C606 Grooved and Shouldered Joints
- U. MSS SP78 Cast Iron Plug Valves, Flanged and Threaded Ends

1.6 SUBMITTALS

- A. Furnish the following submittals.

SUBMITTAL	DESCRIPTION
Shop Drawings	Required per valve shop drawing requirements.
Catalog Data	Required per catalog data requirements. Show lining and coating data and thicknesses.
Installation Instructions	Required per installation instruction requirements.
O & M Instructions	Required per operation and maintenance instruction requirements.
Certificate of Compliance	Submit certified test results for proof of design, hydrostatic and leakage tests. Submit certified report of testing of factory-applied linings

SUBMITTAL	DESCRIPTION
Warranty	Furnish one-year warranty from date of final acceptance

- B. Refer to Section 01 30 00 for definition of requirements for shop drawings, catalog data, installation instructions, O&M instructions, and certificates of compliance.

1.7 DELIVERY, STORAGE AND HANDLING

- A. Refer to contract documents for delivery, storage, and handling requirements.
- B. Manufacturer's instruction and warranty requirements for delivery, storage and handling of valves shall be strictly followed.
- C. Actuator and valve shall be shipped and delivered to jobsite as unit.

1.8 PAYMENT

- A. Payment for Work in this section shall be included as part of the lump-sum for Bid Item No. 1.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Acceptable Manufacturers include:

ITEM	MANUFACTURER	MANUFACTURER LOCATION
Eccentric Plug Valves and Actuators – Full Rectangular Port: 100% Pipe Area (½"-72")	DeZurik PEF (valve and actuator)	Sartell MN
	Accepted equal	

2.2 MATERIALS

- A. Refer to Section 01 60 00 for basic requirements for products and materials.
- B. The following is being conveyed:

FLUID	VISCOSITY (77°F)	SPECIFIC GRAVITY	TEMP	FREEZING POINT	BOILING POINT	VAPOR PRESS (77°F)	pH	SOLIDS CONTENT
Waste water	0.894cP	1.01	33-90°F	32°F	212°F	0.46 psia	6.5-8.5	<1.0%

- C. Eccentric plug valves shall be constructed of the following materials:

ITEM	MATERIAL	SPECIFICATION
Body	Cast Iron	ASTM A126 Class B The body shall have minimal pooling, and shall provide complete flushing of the valve every time it cycles. Bodies shall be furnished with a nickel seat as indicated below. The plug shall seat against the body with a camming action.

Body Seat	Min. 95% Pure Nickel	Raised seat; 1/8-inch min. seat thickness
Dimensions	Laying Length	AWWA C517, Table 1
Plug	Ductile Iron	Rectangular plug; ASTM A536 Grade 65-45-12 Plug shall be a solid one-piece ductile iron casting. The plug shall have a cylindrical seating surface eccentrically offset from the center of the plug shaft. The interference between the plug face and body seat, with the plug in the closed position, shall be externally adjustable in the field with the valve in the line under pressure.
Plug Facing (for sealing surface)	Neoprene Synthetic Rubber (Chloroprene) (use with water and wastewater)	ASTM D1418 Black Plug facing shall be rated by manufacturer as suitable for sewage service.
Plug Port	n/a	Rectangular port; 100% area of pipe to which the plug valve is connected
Trim	Stainless Steel	SAE Type 316
Bearings – Valves 1/2"-36"	Stainless Steel Sleeve Type	SAE Type 316 Sintered, oil impregnated permanently lubricated
Bearings – Valves > 36" (Upper and Lower Plug Journals)	Stainless Steel	SAE Type 316.
Cover Bolts	Stainless Steel	SAE Type 316
Cover Nuts	Stainless Steel	SAE Type 316
Centered Oil Bearings	Stainless Steel	SAE Type 316
Stem Packing Seals	NBR Synthetic Rubber (Nitrile Butadiene Rubber)	ASTM D1418 Do not expose to acetone, esters, ketones, chlorinated hydrocarbons, nitro hydrocarbons, ozone or direct sunlight Shaft seals shall be of the multiple V-ring type with a minimum of four sealing rings. Shaft seals shall be externally adjustable and re-packable under pressure without removing the actuator or bonnet from the valve. Valves utilizing O-ring seals or non-adjustable packing shall not be acceptable.
Grit Seals (Top and Bottom)	PTFE Fluoropolymer (Polytetrafluoroethylene)	ASTM D1418
Flanges Sizes 3"-36" Valve Pressure Rating: 175 psi (sizes 3" thru 12") 150 psi (sizes 14" thru 36")	Cast Iron Bolt Hole Alignment	ASME/ANSI B16.1 Class 125 Raised or plain faced Bolt holes shall straddle horizontal and vertical centerlines of valve.
Flange Alignment		See Section 33 05 31.
Flange Bolts, Nuts, and Washers		See Section 33 05 31.

Flange Gaskets	Provide where shown	AWWA C606 Compatible with adjacent coupling
Epoxy Lining (Internal Iron Surfaces of Valves)	Epoxy	See Section 09 96 56. Do not coat sealing areas and bronze or stainless steel parts.
Epoxy Coating (Exterior iron surfaces of valves)	Epoxy	See Section 09 90 00. Do not coat sealing areas and bronze or stainless steel parts.
Manual Actuator for Valve Sizes 4" and smaller		Provide lever actuator. Non-buried actuators shall clearly indicate valve position.
Manual Actuator for Valve Sizes 6" and larger		Provide worm gear actuator. Worm gears shall be enclosed in a cast iron housing and shall be suitable for running in a lubricant with seals provided on all shafts to prevent entry of dirt and water into the actuator. The actuator shaft and the quadrant shall be supported on permanently lubricated bronze bearings Externally adjustable open and closed position stops shall be provided. The adjustable closed position stop shall be used to set closing torque and provide adjustment to compensate for change in pressure differential or flow direction changes. Non-buried actuators shall clearly indicate valve position. Valve actuator shall be designed to provide leak-tight shutoff for a maximum actual working pressure of 75 psi.

PART 3 –

EXECUTION

3.1 INSTALLATION

- A. Furnish and install plug valves at locations shown on Plans and Submittals.
- B. The following installation standards shall be followed:
 - 1. Manufacturer's installation and warranty requirements
 - 2. Applicable OSHA and Cal OSHA regulations
 - 3. Applicable fire, plumbing, and mechanical code requirements
- C. Refer variances between above documents and Contract Documents to Owner's Representative.
- D. Install plug valves to tolerances recommended by manufacturer. Unless otherwise shown, install plug valves true, plumb, and level using precision gauges and levels.

- E. Install valve so seat is opposite the high-pressure side.
- F. Unless otherwise directed, observe the following suggestions (if possible) for installation of eccentric plug valves on sewage, grit, sludge, or other liquid systems containing solids, or fine sand: Install valve so that valve stem is in the horizontal position (orient the valve to prevent the valve body from filling up with solids, when closed). However, for valves without a worm gear, electric, or air operators (and only if the line pressure exceeds 25 psi), the flow should force the plug against the seat.
- G. In horizontal pipelines, the plug shall swing upwards when opening, to permit the solids to be flushed out.
- H. In vertical pipelines, install the plug valve with the seat side up.
- I. For a special application, or when in doubt, consult with the manufacturer prior to installation.

3.2 FIELD QUALITY CONTROL

- A. Test valves at same time connecting pipelines are pressure tested. Valves, operators, or control and instrumentation elements whose pressure rating is less than test pressure shall be protected or isolated during pressure testing.
- B. Field testing shall include:

ITEM	TEST FOR	TEST STANDARD (ASTM OR OTHER TEST STANDARD)	FREQUENCY	FIRST TEST PAID FOR BY	RETESTS PAID FOR BY
Plug Valve	Installation & Leakage	Visual inspection for drip tight finished installation under pressure.	1 inspection	Owner	Owner
	Pressure Test	See Section 33 08 11.	1 test	Contractor	Contractor
	Actuator	Operate valve through 10 full cycles of opening and closing. Valve shall operate from full open to full close without sticking, or binding and without required operating torque exceeding 150 ft-lbs at any point	1 test	Contractor	Contractor
	Field Performance	Demonstrate compliance to Contract Documents and Manufacturer's printed literature	1 test	Contractor	Contractor
	11-month Warranty Inspection	Demonstrate compliance to Contract Documents and Manufacturer's printed literature	1 test	Owner	Contractor

**** END OF SECTION ****

**SECTION 33 12 18
CHECK VALVES**

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Materials, testing, and installation of 10-inch diameter check valves to be installed as part of the new discharge piping for Pump #1 and Pump #2 in the Pump Room.
- B. Check valves shall be suitable for sewage service (able to pass a minimum 3-inch diameter solid), and shall be "swing type: The disc shall be Buna N with steel reinforcement and nylon reinforcement. The disc seat shall be at a 45-degree angle, and the interior of the valve shall allow the disc to swing a total of 35 degrees (from fully Open to fully Closed).

1.2 RELATED WORK

- A. Section 01 30 00: Contractor Submittals
- B. Section 01 40 00: Quality Control
- C. Section 01 53 00: Protection of Existing Facilities
- D. Section 01 55 00: Site Access and Storage
- E. Section 01 60 00: Products, Materials, Equipment and Substitutions
- F. Section 09 90 00: Protective Coatings
- G. Section 09 96 56: Epoxy Linings and Coatings
- H. Section 33 05 31: Pipeline Joint Materials
- I. Section 33 08 11: Pressure Testing

1.3 SYSTEM DESCRIPTION

- A. Furnish and install complete operating check valve including appurtenant mountings or connections required for compliance with Manufacturer's installation requirements and applicable standards.
- B. Check valves shall prevent backflow of fluid when downstream pressure exceeds upstream pressure. Valves shall seat drip tight against a downstream seating pressure equal to rated design pressure of valve. A one-piece "disc accelerator" shall be provided to reduce the closing time of the disc. Disc "cracking" pressure shall be 0.3 psig.
- C. Each check valve shall include a "backflow actuator" device that will manually open the check valve to allow backflow through the valve.
- D. Each check valve shall include a mechanical disc position indicator that provides visual evidence of the valve disc position.
- E. Furnish and install a limit switch for each check valve. This switch will provide a signal that can be remotely monitored to indicate valve is fully Open or fully Closed. The limit switch installation shall include all manufacturer-recommended appurtenances, including:

- A mounting bracket that securely holds each limit switch in-place on the check valve to enable the limit switch to reliably indicate the check valve is in Open or Closed position.
 - Electrical wiring to each limit switch per the Electrical Drawings
- F. Valve shall be designed to provide non-slam closure as a result of the following design features:
- Short Disc Stroke
 - Memory-Flex Disc Action
 - Disc Accelerator

1.4 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workmen trained and experienced in necessary trades and crafts and completely familiar with specified requirements and methods for proper performance of Work of this section.
- B. Products coming into contact with potable water shall contain no more than 0.25% lead by average weight in compliance with the Federal Reduction of Lead in Drinking Water Act and California law AB1953.
- C. Factory testing shall include:

ITEM	TEST FOR	TEST STANDARD (ASTM OR OTHER TEST STANDARD)	FREQUENCY	FIRST TEST PAID FOR BY	RETESTS PAID FOR BY
Swing Check Valve	Hydrostatic Shell Test	AWWA C508 Section 5.2.1	1 each valve	Contractor	Contractor
	Hydrostatic Seat Leakage Test	AWWA C508 Section 5.2.2	1 each valve	Contractor	Contractor
Interior Lining	Holidays and Lining Thickness	See Section 09 96 56	1 each valve	Contractor	Contractor

- D. The Valve Disc shall be cycle tested 1,000,000 times in accordance with ANSI/AWWA C508, and shall show no signs of wear, cracking, or distortion to the valve disc, or seat, and shall remain drop tight at both high and low pressures.
- E. The flex portion of the disc contains nylon reinforcement and shall be warranted for twenty-five years.
- F. Valves shall be manufactured in an ISO 9001-controlled manufacturing process.
- G. All valve shall be hydrostatically tested and seat tested to demonstrate zero leakage.
- H. Valve manufacturer shall demonstrate a minimum of five (5) years of experience in the manufacture of resilient, flexible disc check valves with hydraulic cushions.

1.5 REFERENCES

- A. ASME/ANSI B1.20.1 Pipe Threads, General Purpose (Inch)
- B. ASME/ANSI B16.1 Gray Iron Pipe Flanges and Flanged Fittings – Classes 25, 125, and 250
- C. ASME/ANSI B16.3 Malleable Iron Threaded Fittings: Classes 150 and 300
- D. ASME/ANSI B16.4 Gray Iron Threaded Fittings: Classes 125 and 250
- E. ASME/ANSI B16.10 Face-to-Face and End-to-End Dimensions of Valves
- F. ASME/ANSI B16.42 Ductile Iron Pipe Flanges and Flanged Fittings, Classes 150 and 300
- G. API/ANSI 594 Check Valves: Flanged, Lug, Wafer and Butt-welding
- H. ASTM A48 Gray Iron Castings
- I. ASTM A126 Gray Iron Castings for Valves, Flanges and Pipe Fittings
- J. ASTM A193 Alloy Steel and Stainless Steel Bolting for High-Temperature or High Pressure Service and Other Special Purpose Applications
- K. ASTM A194 Carbon Steel, and Alloy Steel, and Stainless Steel Nuts for Bolts for High Pressure or High Temperature Service, or Both
- L. ASTM A216 Steel Castings, Carbon, Suitable for Fusion Welding, for High-Temperature Service
- M. ASTM A217 Steel Castings, Martensitic Stainless and Alloy, for Pressure-Containing Parts, Suitable for High-Temperature Service
- N. ASTM A269 Seamless and Welded Austenitic Stainless Steel Tubing for General Service
- O. ASTM A276 Stainless Steel Bars and Shapes
- P. ASTM A313 Stainless Steel Spring Wire
- Q. ASTM A351 Castings, Austenitic, for Pressure-Containing Parts
- R. ASTM A536 Ductile Iron Castings
- S. ASTM A582 Free-Machining Stainless Steel Bars
- T. ASTM B16 Free-Cutting Brass Rod, Bar and Shapes for Use in Screw Machines
- U. ASTM B62 Composition Bronze or Ounce Metal Castings (do not use for potable water wetted surfaces)
- V. ASTM B148 Aluminum-Bronze Sand Castings
- W. ASTM B271 Copper-Base Alloy Centrifugal Castings
- X. ASTM B584 Copper Alloy Sand Castings for General Applications
- Y. ASTM D2000 Rubber Products in Automotive Applications
- Z. AWWA C207 Steel Pipe Flanges for Waterworks Service, Sizes 4" through 144"
- AA. AWWA C213 Fusion-Bonded Epoxy Coating for Interior and Exterior of Steel Water Pipelines
- BB. AWWA C508 Swing Check Valves for Waterworks Service, 2-inch through 24-inch NPS
- CC. AWWA C550 Protective Interior Coatings for Valves and Hydrants
- DD. MSS SP71 Gray Iron Swing Check Valves, Flanged and Threaded Ends
- EE. MSS SP125 Gray Iron and Ductile Iron In-Line, Spring-Loaded, Center-Guided Check Valves
- FF. MSS SP126:2013 In-Line, Spring-Assisted, Center-Guided Check Valves (Carbon, Alloy Steel, Stainless Steel, & Nickel Alloys)
- GG. MSS SP136 Ductile Iron Swing Check Valves
- HH. NSF/ANSI 61 Drinking Water System Components – Health Effects
- II. NSF/ANSI 372 Drinking Water System Components – Lead Content (Formerly NSF/ANSI 61 Annex G)

1.6 SUBMITTALS

A. Furnish the following submittals.

SUBMITTAL	DESCRIPTION	
Shop Drawings	Required per valve shop drawing requirements. Include detail of any penetration of valve body by hinge pin showing packing gland, hinge pin gland, cap and other pieces used.	
Catalog Data	Required per catalog data requirements.	
	Show lining and coating data and thicknesses.	
Installation Instructions	Required per installation instruction requirements.	
O & M Instructions	Required per operation and maintenance instruction requirements.	
Certificate of Compliance	Submit certified report of testing of factory-applied linings	
	Submit affidavit of compliance with AWWA C508 for swing check valves	
Warranty	Furnish one-year warranty from date of final acceptance	

B. Refer to Section 01 30 00 for definition of requirements for shop drawings, catalog data, installation instructions, O&M instructions and certificates of compliance.

1.7 DELIVERY, STORAGE AND HANDLING

- A. Refer to contract documents for delivery, storage, and handling requirements.
- B. Manufacturer's instruction and warranty requirements for delivery, storage and handling of check valves shall be strictly followed.

1.8 PAYMENT

A. Payment for Work in this section shall be included as part of the lump-sum for Bid Item No. 1.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Acceptable Manufacturers include:

ITEM	MANUFACTURER	MANUFACTURER LOCATION
Rubber Flapper Swing Check Valves with Disc Accelerator 2"-36"	Val-Matic Valve and Manufacturing Corp. Series 7200 Surgebuster	Elmhurst, IL
	Or City-approved "equal"	

2.2 MATERIALS

- A. Refer to Section 01 60 00 for basic requirements for products and materials.
- B. Swing check valves for waterworks service shall conform to AWWA C508.

C. The following is being conveyed:

FLUID	VISCOSITY (77°F)	SPECIFIC GRAVITY	TEMP	FREEZING POINT	BOILING POINT	VAPOR PRESS (77°F)	pH	SOLIDS CONTENT
Waste water	0.894cP	1.01	33-90°F	32°F	212°F	0.46 psia	6.5-8.5	<1.0%

D. Rubber flapper swing check valves 6"-36" with disc accelerator shall be constructed of the following materials:

ITEM	MATERIAL	SPECIFICATION
Body and Cover	Ductile Iron (for pressures 0-300 psi)	ASTM A536 Grade 65-45-12
Laying Length		ASME/ANSI B16.10 Table 7(Class 125 or 150)
Disc Reinforcement	Alloy Steel	Steel Disc insert and steel bar hinge
Disc Lining	NBR Synthetic Rubber (Nitrile Butadiene Rubber) (Buna N)	Precision Molded per ASTM D2000-BG Vulcanize to metal pieces covered NSF61 Listed for potable water Do not expose to acetone, esters, ketones, chlorinated hydrocarbons, nitro hydrocarbons, ozone or direct sunlight
Disc Accelerator	Stainless Steel	SAE Type 302
Bonnet Bolts, Nuts and Washers	Stainless Steel	SAE Type 316 with anti-seize lubricant
Flanges Sizes 6-36" Working Pressures 0-150 psi	Ductile Iron	ASME/ANSI B16.42 Class 150 Raised or plain faced
Flange Alignment	Valves	Bolt-holes shall straddle horizontal and vertical centerlines of valve.
Flange Bolts, Nuts, and Washers	Various Steels	See Section 33 05 31.
Flange Gaskets		See Section 33 05 31.
Epoxy Lining and Coating (Iron Surfaces of Valves ≥ 4")	Fusion-Bonded Epoxy	See Section 09 96 56. Fusion bonded epoxy coating on Interior and Exterior surfaces. NSF61 Listed for potable water Do not coat sealing areas and bronze or stainless steel parts.

E. The following product design criteria, options and accessories are required:

ITEM	DESCRIPTION	
Rated Working Pressure	150 psi on discharge side piping	
Rubber Flapper Swing Check Valves	Design	Valve shall consist of body, flapper and bolted cover.
	Valve Seat	Seat at 45° angle to pipe centerline, with 35° degree swing to full-open.
	Manual Backflow Actuator	Required (screw type with stainless steel T-handle)
	Position Indicator Design Closure Device	Provide position indicator / Provide pre-wired limit or proximity switch

ITEM	DESCRIPTION	
Threaded Boss	1" diameter threaded boss on upstream side of the flapper.	This boss will be the point of connection for 1" diameter air release valve piping associated with the pump's self-priming function.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Furnish and install check valves at locations shown on Plans and Submittals.
- B. The following installation standards shall be followed:
 - 1. Manufacturer's installation and warranty requirements
 - 2. Applicable OSHA and Cal OSHA regulations
 - 3. Applicable fire, plumbing, mechanical and electrical code requirements
- C. Refer variances between above documents and Contract Documents to Owner's Representative.

3.2 FIELD QUALITY CONTROL

- A. Valves shall be tested at same time connecting pipelines are pressure tested and in accordance with sections of Contract Documents covering testing. Valves, operators, or control and instrumentation elements whose pressure rating is less than test pressure shall be protected or isolated during pressure testing.
- B. Field testing shall include:

ITEM	TEST FOR	TEST STANDARD (ASTM OR OTHER TEST STANDARD)	FREQUENCY	FIRST TEST PAID FOR BY	RETESTS PAID FOR BY
Check Valve	Installation & Leakage	Visual inspection for drip tight finished installation under pressure.	1 inspection	Owner	Owner
	Pressure Test	See Sections 33 08 11.	1 test	Contractor	Contractor
	Field Performance	Demonstrate compliance to Contract Documents and Manufacturer's printed literature	1 test	Contractor	Contractor
	11-month Warranty Inspection	Demonstrate compliance to Contract Documents and Manufacturer's printed literature	1 test	Owner	Contractor

**** END OF SECTION ****

**SECTION 33 12 71
SLIDE GATES**

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. The work to be performed under this Section shall include furnishing all labor, materials, tools and equipment necessary to install and test all slide gates, consisting of, but not limited to frames, discs, seals, stems, operators, floor stands, stem guides, anchorage, and all other appurtenances, in place and complete.
- B. The new slide gate shall be installed the point of discharge of the influent sewer to the lift station's wetwell.

1.2 RELATED WORK

- A. Section 01 30 00: Contractor Submittals
- B. Section 01 40 00: Quality Control
- C. Section 01 53 00: Protection of Existing Facilities
- D. Section 01 55 00: Site Access and Storage
- E. Section 01 60 00: Products, Materials, Equipment and Substitutions
- F. Section 09 90 00: Protective Coatings
- G. Section 09 96 56: Epoxy Linings and Coatings
- H. Section 33 05 31: Piping Joint Materials

1.3 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workmen trained and experienced in necessary trades and crafts and completely familiar with specified requirements and methods for proper performance of the Work of this section.

1.4 APPLICABLE PUBLICATIONS

- A. The following publications listed below form a part of this Specification to the extent referenced. The publications are referred to in this specification by basic designation only.
 - 1. AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM) PUBLICATIONS. D635-81 Test Method for Rate of Burning and/or Extent and Time of Burning of Self-Supporting Plastics in a Horizontal Position
D648-82 Test Method for Deflection Temperature of Plastics Under Flexural Load
NASA CR-1457, "Manual for Structural Stability Analysis of Sandwiched Plates and Shells" et al.
 - 2. AMERICAN WATER WORKS ASSOCIATION (AWWA) C563 Standard for Composite Sluice Gates

1.5 REFERENCES

- A. ASME/ANSI B16.5 Pipe Flanges and Flanged Fittings: NPS ½ Through 24"

- B. ASME/ANSI B16.47 Large Diameter Steel Flanges: NPS 26 Through NPS 60
- C. ASTM A276 Stainless Steel Bars and Shapes
- D. ASTM D2000 Rubber Products in Automotive Applications
- E. AWWA C213 Fusion-Bonded Epoxy Coating for the Interior and Exterior of Steel Water Pipelines
- F. AWWA C550 Protective Epoxy Interior Coatings for Valves and Hydrants
- G. AWWA C563 Fabricated Composite Slide Gates

1.6 SUBMITTALS

- A. Furnish the following submittals.

SUBMITTAL	DESCRIPTION	
Materials and Shop Drawings	Copies of all materials required to establish compliance with the specifications. Submittals shall include: (1) certified Shop and erection drawings and data regarding the slide gate; (2) layout drawings that show how the gate will mount to the wetwell wall, as well as location of all stem guides; (3) literature or drawings describing the equipment and showing all important details of construction and dimensions; (4) description of all appurtenances.	
Catalog Data	Required per catalog data requirements. Show lining and coating data and thicknesses.	
Installation Instructions	Required per installation or application instruction requirements. Instructions shall address adjustment of gates, operators and all accessories.	
O & M Instructions	Required per operation and maintenance instruction requirements	
Certificate of Compliance	Submit affidavit of compliance for fabricated-steel slide gates with AWWA C563.	
Test Record Transcripts	Submit for factory tests per test record transcript requirements.	
Warranty	Furnish one-year warranty from date of final acceptance	

- B. Refer to Section 01 30 00 for definition of requirements for shop drawings, catalog data, installation instructions, O&M instructions, certificates of compliance, and test record transcripts.

1.7 DELIVERY, STORAGE AND HANDLING

- A. Refer to contract documents for delivery, storage, and handling requirements.
- B. All equipment shall be delivered in suitable packaging, cases, or crates and stored or placed in the appropriate manner. Each package shall have an identifying mark and a complete list showing contents
- C. Manufacturer's instruction and warranty requirements for delivery, storage and handling of hydraulic gates and valves shall be strictly followed.

1.8 WARRANTY AND GUARANTEE

- A. **The Manufacturer shall guarantee that the slide gates, when installed and operated as recommended by the Manufacturer with a documented maintenance program, shall provide trouble-free operation for a period of ten (10) years.** If the Owner or Engineer is not completely satisfied with the

performance of the product, the Manufacturer shall remedy the problem at no cost or refund the materials and installation cost upon the return of the equipment. The Manufacturer shall guarantee the following:

1. Leakage shall be no more than that allowed by the AWWA C563 Standard during the guarantee period.
2. Door (disc) shall be free of sticking or binding as judged by the Engineer (move freely via operator provided) with no exercising required. Gate operators are to be warranted by the operator manufacturer.

1.9 OTHER REQUIREMENTS

- A. The new slide gate will be installed where the existing Waterman 30x30 cast iron sluice gate was previously located. That old sluice gate installation includes a wall thimble which is not shown to be removed as part of the sluice gate demolition. Contractor shall prepare the wall surface as required for proper installation and function of the new slide gate.
- B. All gates shall be fully assembled in their frames except for operators, guides, stem-extension, and stem covers or concrete-mounted pedestals. Where shipping constraints require it, frame may be partially assembled such that the top may be easily mounted to the bottom containing the disc.
- C. Where square-to-circular or bell-lip conversion is required the Contractor shall provide a bell-end pipe insert of suitable diameter and water stop.
- D. P-Bulb or J-Bulb type seals attached to the Disc / mounted to the frame, or any seal that needs replacement in less than 20 years shall not be acceptable. No part of the seal shall protrude into the clear opening.
- E. All sluice gates shall be supplied by the same manufacturer, who shall be fully experienced, reputable and qualified in the manufacturing of the equipment furnished and who has been building said equipment for a minimum period of ten (10) years.

1.10 PAYMENT

- A. Payment for Work in this section shall be included as part of the lump-sum for Bid Item No. 1.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Sluice gates shall be designed for the seating and unseating heads as listed in the gate schedule. Sluice gates shall exceed the standard of AWWA C563. Exceeding the conformance to AWWA C563 applies to discs and frames with a safety factor of five (5) with regard to tensile, compressive and shear strength and with the requirement that all gates will yield no more leakage than shown in (AWWA C563)

Field Leakage Test. Materials of construction shall be suitable for the environment in which the sluice gates shall be installed and operated

2.2 MATERIALS FOR FABRICATED COMPOSITE SLIDE GATES

- A. Fabricated-composite slide gates for normal water and wastewater service shall comply with AWWA 563 and shall be constructed of materials as described below.
- B. Slide Gate Frame: Slide Gate Frame shall be fabricated from Type 316 (or Type 316L) stainless steel. Frame shall be wall-mounted against a 1" nominal grout base. Provide frame accessories (or frame modifications) as required for the slide gate operating stem to fit through the existing floor opening (through which the operating stem for the existing deteriorated sluice gate presently extends).
- C. Slide (Disc): Shall be constructed with a reinforced rigid composite skin, having a minimum thickness of 1/8-inch on the outside. Slide (disc) shall have an internal matrix of carbon steel of suitable strength for the specified service. The total minimum slide thickness should not be less than 2". The slide (disc) outer surface skins shall be a homogeneous plastic material having extremely high tensile and impact strength, be nontoxic and shall be stabilized against ultraviolet light. The plastic material shall be an Aramid fiber from the KEVLAR family of fibers, and shall have the following minimum properties and shall be designed to limit the deflection to a maximum of 1/1000 of the span under design head conditions based upon horizontal support members only. Manufacturer shall submit drawings and comprehensive design criteria to substantiate that the required deflection figure for each door has been achieved. Safety factors shall be calculated for the disc under maximum head, and shear at the disc/seal interface. No substitute of fiber type will be acceptable. FRP, GRP, plastic coated steel or externally reinforced slide (disc) shall not be acceptable. All welds on the slide shall be continuously welded and no stitch welding to be allowed.
- D. Materials Properties Table:

MATERIAL PROPERTY	PROPERTY VALUE
Tensile Strength	15,400
Young's Modulus	1,756,000 psi
Flexural Strength	28,000 psi
Flexural Modulus	1,497,000 psi
Compressive Strength	30,200 psi
Impact Strength	9.65 ft-lb/inch
Water Absorption	0.09%
Specific Gravity	1.72
Coefficient of Thermal Expansion	1.6 x 10 ⁻⁵ per C
Heat Distortion Point	80 Degrees C (ASTM D648)
Low Temperature Impact Strength	93% @ -20C
Notch Sensitivity	Shall not be notch sensitive
Weathering Properties	Excellent
Fire Resistance	Class 1 Spread of Flame, Rating BS476: Part 1: 1953 self-extinguishing, ASTM D635-56R

Chemical Resistance	Organics, Alkaline, Ozone (2 to 3 PPM)
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- E. Foam Filler: Rigid Polyurethane foam shall be used as filler between the steel grid reinforcing system and shall be a minimum of 7 LB density/cu.ft.
- F. Seals: The sealing arrangement for the reinforced plastic slide gates shall be comprised of sealing faces and side guides constructed of ultra-high molecular weight polyolefin having an extremely low coefficient of friction and a backing constructed of highly resilient expanded neoprene. Guides and seating of the gate shall be easily adjustable (min. 5/8-inch). All moving contact surfaces shall be compatible to each other thereby minimizing sticking / jamming and making the operation easy. **Leakage rates shall be one-half (½) that allowed by AWWA C563.**
- G. Fasteners: Shall be 316 stainless steel. All anchor bolts, assembly bolts, screws, nuts, etc. shall be of ample section to safely withstand the forces created by operation of the gate while subjected to the heads specified.
- H. Stems: All stems shall be the rising type. The entire stem, including extension stem, shall be Type 304 Stainless Steel solid bar. The sections of extension stems shall be joined together by solid couplings, threaded and keyed to the stems. All couplings of the same size shall be interchangeable. Stems shall be furnished with adjustable, stem guides, spaced as necessary to maintain a slenderness ratio L/R of less than 200. Stems shall be of ample cross section to prevent distortion and shall have stub acme threads. Stems shall be designed to withstand tensile and compressive loads that occur under maximum operating conditions. Design for compressive loading shall meet AISC code where K=1 with a minimum safety Factor of 2 to 1. These requirements exceed AWWA standards. Stems shall be cold rolled or cut with a double start stub acme thread and a finish of 32 microns or less. Stems shall be fixed to the disc by a threaded and keyed assembly into a lifting nut attached to the disc in a lifting bracket, which is bolted to the disc. The bolts securing the bracket shall be in tension and not shear. Bolts in shear will not be acceptable as they will bind against the outer material causing stress. Provide a "see-through" stem cover to protect the stem from weather and blowing dirt. It is intended that gate position can be determined by seeing the stem position.
- I. Slide Gate Operator: The slide gate operator shall be manual, and shall be stand-mounted on top of the lift station's top slab at the indicated location. The slide gate operator shall be located over the existing opening in the lift station top slab so that the existing operating stem's horizontal location is maintained for the new slide gate.

2.3 PRODUCT DESIGN CRITERIA

- A. The following product design criteria, options and accessories are required for slide gates:

ITEM	DESCRIPTION	
Slide Gates	Fluid Handled	Wastewater
	Seating Pressure	30 feet
	Unseating Pressure	30 feet
	Actuator Mounting	Yoke (on head frame)

ITEM	DESCRIPTION	
	Stem	Rising Stem (provide "see-through" stem cover)
	Gate Position Indicator	Required
	Guide Frame Style	Anchor bolt wall-mount
	Seals	Side, Invert and Top
	Allowable Leakage at Seating Pressure	One-half of the allowable rate per AWWA C563.
	Allowable Leakage at Unseating Pressure	One-half of the allowable rate per AWWA C563.

2.5 SLIDE GATE ACTUATOR STEM INSTALLATION CONFIGURATION

- A. Contractor shall design the slide gate to locate the actuating stem to be aligned in the center of the existing openings in the Pump Room floor slab and Pump Room top slab.
- B. Contractor shall furnish and install a gas-tight seal for the actuating stem where it penetrates the Pump Room floor slab. This seal shall be suitable for long-term service of this gate without sewage gases leaking into the Pump Room via the floor penetration. This seal shall be as recommended by the slide gate manufacturer.

2.6 YOKE (HEAD FRAME)

- A. The design drawings show the slide gate assembly includes extended side rails with yoke (or head frame) at the top. A slide gate configuration that replaces the yoke, or head frame, with a wall bracket upon which the gate actuator is mounted, may be proposed by Contractor if that alternative layout is recommended by the slide gate manufacturer. This design change will be evaluated as part of the shop drawing review process.

2.7 LEAKAGE RATE

- A. Slide gate leakage shall be not exceed one-half of the maximum allowable rate that is allowed by AWWA C563 standard during the guarantee period.

2.8 WARRANTY

- A. Slide gate manufacturer shall guarantee the slide gate, when installed and operated as recommended by the manufacturer with a documented maintenance program, trouble-free operation for a period of ten (10) years.

2.9 SLIDE GATE MANUFACTURER

- A. The slide gate to be furnished for this construction contract shall be the Co-Plastix slide gate as manufactured by: Alfa Laval Ashbrook Simon-Hartley, Houston, Texas (represented in Southern California by Southwest Valve & Equipment), or an "approved equal" fiberglass slide gate.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Make field measurements needed to install hydraulic gates and valves before submitting shop drawings or ordering. Make minor changes in dimensions and alignments as needed to avoid utilities or structural conflicts.

3.2 INSTALLATION

- A. Furnish and install slide gates at locations shown on Plans and Submittals.
- B. The following installation standards shall be followed:
 - 1. Manufacturer's installation and warranty requirements
 - 2. Applicable OSHA and Cal OSHA regulations
 - 3. Applicable building and plumbing code requirements
- C. Refer variances between above documents and Contract Documents to Owner's Representative.
- D. Install slide gate to tolerances recommended by manufacturer. Unless otherwise shown, install hydraulic gates and valves true, plumb and level using precision gauges and levels.
- E. Installation of all gates and guides shall be done by the Contractor in a manner acceptable to the Manufacturer and Owner. It shall be the responsibility of the Contractor to handle, store, and install the equipment specified in this Section in strict accordance with the Manufacturer's drawings and recommendations. Frames and guides shall be installed in a true vertical plane with 90-degree corners. Install slide gates in conformance with the best practices and methods.

3.3 INSPECTION AND TESTING

- A. Furnish the services of a factory representative for one (1) day who has complete knowledge of proper operation and maintenance to inspect the final installation and supervise a test run of the equipment.
- B. Maximum gate leakage shall be as defined in the General Design Criteria of this Specification, herein. If gates, operators, and appurtenances do not meet specified requirements, corrective measures shall be taken by the Contractor, or the equipment shall be removed and replaced with equipment that satisfies the conditions specified.

3.4 FIELD QUALITY CONTROL

- A. Field testing shall include:

ITEM	TEST FOR	TEST STANDARD (ASTM OR OTHER TEST STANDARD)	FREQUENCY	FIRST TEST PAID FOR BY	RETESTS PAID FOR BY
Hydraulic Gates	Leakage	Measure flow rate at seating pressure	1 each gate	Contractor	Contractor
	Installation & Leakage	Visual inspection of finished installation	1 inspection	Owner	Contractor
	Field Performance	Demonstrate compliance to Contract Documents and Manufacturer's printed literature	1 test	Contractor	Contractor
	11-month Warranty Inspection	Demonstrate compliance to Contract Documents and Manufacturer's printed literature	1 test	Owner	Contractor

** END OF SECTION **

**SECTION 33 30 33
PVC SCHEDULE 40 AND 80 PLASTIC PIPE**

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Materials, testing, and installation of PVC plastic pipe for odorous air.
- B. Outdoor piping exposed to sunlight shall be painted with a coat of water-based latex paint per Section 09 90 00. Paint color shall be white to reduce thermal expansion.

1.2 RELATED WORK

- A. Section 01 30 00: Contractor Submittals
- B. Section 01 40 00: Quality Control
- C. Section 01 53 00: Protection of Existing Facilities
- D. Section 01 55 00: Site Access and Storage
- E. Section 01 60 00: Products, Materials, Equipment and Substitutions
- F. Section 09 90 00: Protective Coatings
- G. Section 31 23 33: Trenching and Backfilling
- H. Section 33 05 31: Piping Joint Materials
- I. Section 33 08 11: Pressure Testing

1.3 SYSTEM DESCRIPTION

- A. Furnish and install complete operating piping system including appurtenant structural, mechanical and/or electrical mountings or connections required for compliance with Manufacturer's installation requirements and compliance with applicable building codes and standards.

1.4 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workmen trained and experienced in necessary trades and crafts and completely familiar with specified requirements and methods for proper performance of Work of this section.
- B. Pipe and fittings shall be produced by same Manufacturer
- C. Mark pipe with nominal size, type, class, schedule or pressure rating, and Manufacturer.
- D. Factory testing shall include:

ITEM	TEST FOR	TEST STANDARD (ASTM OR OTHER TEST STANDARD)	FREQUENCY	FIRST TEST PAID FOR BY	RETESTS PAID FOR BY
PVC Piping, Schedule Type	ASTM Compliance	Mark pipe and fittings in accordance with ASTM D1785	At least one mark each item	Contractor	Contractor

1.5 REFERENCES

- A. ASME/ANSI B1.20.1 Pipe Threads, General Purpose (Inch)
- B. ASME/ANSI B16.5 Pipe Flanges and Flanged Fittings: NPS ½ through NPS 24
- C. ASTM D1599 Standard Test Method for Resistance to Short-Time Hydraulic Pressure of Plastic Pipe, Tubing and Fittings
- D. ASTM D1784 Rigid Poly(Vinyl-Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl-Chloride) (CPVC) Compounds
- E. ASTM D1785 Poly(Vinyl-Chloride) (PVC) Plastic Pipe, Schedules 40, 80 and 120
- F. ASTM D2241 Poly (Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series)
- G. ASTM D2412 Standard Test Method for Determination of External Loading Characteristics of Plastic Pipe by Parallel-Plate Loading
- H. ASTM D2466 Poly(Vinyl-Chloride) (PVC) Plastic Pipe Fittings, Schedule 40
- I. ASTM D2467 Poly(Vinyl-Chloride) (PVC) Plastic Pipe Fittings Schedule 80
- J. ASTM D2672 Joints for IPS PVC Pipe Using Solvent Cement
- K. ASTM D2564 Solvent Cements for Poly(Vinyl-Chloride) (PVC) Plastic Piping Systems
- L. ASTM F656 Primers for Use in Solvent Cement Joints of Poly(Vinyl Chloride) (PVC) Plastic Pipe and Fittings
- M. ASTM D2774 Underground Installation of Thermoplastic Pressure Piping
- N. ASTM D2855 Two-Step (Primer and Solvent Cement) Method of Joining Poly (Vinyl Chloride)(PVC) or Chlorinated Poly (Vinyl Chloride) (CPVC) Pipe and Piping Components with Tapered Sockets
- O. ASTM F402 Safe Handling of Solvent Cements, Primers, and Cleaners Used for Joining Thermoplastic Pipe and Fittings
- P. ASTM F477 Elastomeric Seals (Gaskets) for Joining Plastic Pipe
- Q. ASTM F645 Selection, Design and Installation of Thermoplastic Water-Pressure Piping Systems
- R. ASTM F656 Primers for Use in Solvent Cement Joints of Poly(Vinyl-Chloride) (PVC) Plastic Pipe and Fittings
- S. Code of Federal Regulations Title 49
- T. NSF/ANSI 14 Plastics Piping System Components and Related Materials

1.6 SUBMITTALS

- A. Furnish the following submittals.

SUBMITTAL	DESCRIPTION	
Catalog Data	Required per catalog data requirements.	
Installation Instructions	Required per installation or application instruction requirements.	
Certificate of Compliance	Submit Manufacturer's certification of plastic pipe and tubing for each lot delivered per certificate of compliance requirements.	
	Submit copies of solvent cement Manufacturer's report and certification in accordance with ASTM D2564 for PVC piping.	
Test Record Transcripts	Submit test results for factory tests per foundry or test record transcript requirements.	
Warranty	Furnish one -year warranty from date of final acceptance	

- B. Refer to Section 01 30 00 for definition of requirements for shop drawings, catalog data, installation instructions, certificates of compliance, and test record transcripts.

1.7 DELIVERY, STORAGE AND HANDLING

- A. Refer to contract documents for delivery, storage, and handling requirements.
- B. Protect piping materials from sunlight, scoring and distortion.
- C. Do not allow surface temperatures on pipe and fittings to exceed 120°F.
- D. Manufacturer's instruction and warranty requirements for delivery, storage and handling of PVC plastic pipe and fittings shall be strictly followed.

1.8 PAYMENT

- A. Payment for Work in this section shall be included as part of the lump-sum for Bid Item No. 1.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Acceptable Manufacturers include:

ITEM	MANUFACTURER	MANUFACTURER LOCATION
PVC Plastic Pipe and Fittings ½"-24"	Certainteed Pipe	Valley Forge, PA
	Harrington Industrial Plastics, Inc.	Chino, CA
	Harvel Plastics, Inc.	Easton, PA
	J.M. Eagle Manufacturing Company	Los Angeles, CA
	Pacific Plastics	Brea, CA
	Spears Manufacturing Company	Sylmar, CA
	Accepted equal	
PVC Flanges	Spears Manufacturing Company	Sylmar, CA
	Accepted equal	
Solvent Cement PVC	Christy's Red Hot Blue Glue, Low VOC	Anaheim, CA
	IPS Corporation Weld-On 705 or 711	Collierville, TN
	Spears Manufacturing Company PVC 05 or PVC 11	Sylmar, CA
	Accepted equal compatible with pipe material, and CALGreen Code and SCAQMD requirements	

2.2 MATERIALS

- A. Refer to Section 01 60 00 for basic requirements for products and materials.
- B. PVC pipe may be used for temperatures to 110°F, and shall be constructed of the following materials:

MATERIAL/ COMPONENT	STANDARDS/ CHARACTERISTICS	SPECIFICATION/REQUIREMENT
Pipe	Standards	ASTM D1785
	Material	ASTM D1784 Cell Class 12454 Virgin rigid PVC Conform to NSF 14
	Size	As shown on plans.
	Wall Thickness	Schedule 80 / See Plans
	Color	White
Joints	Restrained Style	Solvent-welded socket joints except at valve connections Provide threaded or flanged adaptors as required for valve connections
Fittings	Standards	ASTM D2466
	Weight	Use same schedule as adjacent pipe
	Threads	Injection molded type where required Conform to ASTM F1498
	Tees and Ells	Side-gated
	Socket Fittings	ASTM D2467
	Transition Fittings	Required per CPC 606.2 for transitioning between metal and PVC pipe
	Material and Color	Same as pipe
Solvent Cement	Material	ASTM D656 primer
		ASTM D2564 solvent cement
Flanges	Pressures 0-150 psi	Plain-faced 125 or 150 psi flanges per ANSI B16.5
Flange Alignment	Horizontal Pipelines	Bolt holes shall straddle horizontal centerlines of pipe run to which flanges are attached.
	Vertical Pipelines	Bolt holes shall straddle plant North-South and plant East-West centerlines of pipe run to which flanges are attached.
Flange Bolts, Nuts and Washers and Gaskets		See Section See Section 33 05 31.
Painting/Coating	Exterior Where Exposed to Sunlight or Required in Vaults and Buildings for Color Coding	See Section 09 90 00.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Make field measurements needed to install PVC plastic pipe before submitting shop drawings or ordering. Make minor changes in dimensions and alignments as needed to avoid utilities or structural conflicts.

- B. Clean dirt and moisture from pipe and fittings. Bevel pipe ends per Manufacturer's instructions with chamfering tool or file. Remove burrs.

3.2 INSTALLATION

- A. Refer to Section 31 23 33 for open trench requirements.
- B. The following installation standards shall be followed:
 - 1. Manufacturer's installation and warranty requirements
 - 2. Applicable OSHA and Cal OSHA regulations
 - 3. Applicable building, fire and plumbing code requirements
 - 4. ASTM D2855 Making Solvent-Cemented Joints with Poly(Vinyl Chloride) (PVC) Pipe and Fittings
 - 5. ASTM F402 Safe Handling of Solvent Cements, Primers and Cleaners Used for Joining Thermoplastic Pipe and Fittings
 - 6. ASTM F645 Selection, Design and Installation of Thermoplastic Water Pressure Piping Systems
 - 7. ASTM D2774 Underground Installation of Thermosetting Pressure Piping
 - 8. ASTM F1668 Construction Procedures for Buried Plastic Pipe
- B. PVC plastic pipe shall be furnished and installed by Contractor at locations shown on Plans and Submittals.
- C. Install PVC plastic pipe to tolerances recommended by Manufacturer. Unless otherwise shown, install PVC plastic pipe true, plumb, and level using precision gauges and levels.
- D. Locate unions where shown and where needed for easy access and assembly of piping system.
- E. Install solvent-welded PVC pipe as follows:
 - 1. Do not solvent weld joints when ambient temperatures are below 40°F or above 90°F unless solvents specifically formulated for these conditions are used.
 - 2. De-burr and bevel pipe surfaces to be solvent-welded.
 - 3. Clean and dry pipe surfaces to be solvent-welded.
 - 4. Use only solvent recommended by Manufacturers of pipe and fittings.
 - 5. Apply solvent with a non-synthetic bristle brush no less than ½ nominal size of pipe diameter.

6. Follow proper primer and cement application sequence as described in ASTM D2855.
7. Apply even coat of solvent to inside of fitting and to outside of pipe on full area to be inserted into fitting socket.
8. Insert pipe into fitting to full depth immediately after coating, and then rotate pipe 90 degrees to distribute solvent and remove air bubbles.
9. Remove all excess solvent from outside of joint.
10. Each joint shall remain undisturbed for at least 30 minutes to develop handling strength.
11. Allow 24 hours drying time before pressure testing.

F. Install flanges on PVC pipe as follows:

1. Clean flange surfaces to mate with gasket, removing loose dirt, scale and detritus.
2. Inspect flange bolts and studs for proper size, threading and length.
3. Clean and lubricate bolt threads using lubricant chemically compatible with all materials involved.
4. With gasket in place, align mating flange bolt holes. Make sure mating flange faces are flush against gasket prior to bolt-up.
5. Insert bolts, nuts and washers. Tighten by hand until snug.
6. Before tightening bolts beyond hand-tight, operate adjacent valves through full range of motion to ensure clear unobstructed operation of discs and other internal parts.
7. Tighten bolts in sequence by 5-lb. increments following a 180° opposing sequence.

G. Refer variances between Manufacturer's installation instructions and Contract Documents to Owner's Representative.

3.3 FIELD QUALITY CONTROL

A. Field testing shall include:

ITEM	TEST FOR	TEST STANDARD (ASTM OR OTHER TEST STANDARD)	FREQUENCY	FIRST TEST PAID FOR BY	RETESTS PAID FOR BY
PVC Pipe	Field Performance	Demonstrate compliance to Contract Documents and Manufacturer's printed literature	1 test	Contractor	Contractor

ITEM	TEST FOR	TEST STANDARD (ASTM OR OTHER TEST STANDARD)	FREQUENCY	FIRST TEST PAID FOR BY	RETESTS PAID FOR BY
	11-month Warranty Inspection	Demonstrate compliance to Contract Documents and Manufacturer's printed literature	1 test	Owner	Contractor

** END OF SECTION **

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**SECTION 33 30 34
DUCTILE-IRON PIPE AND FITTINGS**

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Materials and installation of Ductile-Iron Pipe (DIP) and fittings 3"-64" for pressurized sewer applications, as well as vacuum conditions for pump suction piping.

1.2 RELATED WORK DESCRIBED ELSEWHERE

- A. Section 01 30 00: Contractor Submittals
- B. Section 01 40 00: Quality Control
- C. Section 01 53 00: Protection of Existing Facilities
- D. Section 01 55 00: Site Access and Storage
- E. Section 01 60 00: Products, Materials, Equipment and Substitutions
- F. Section 09 90 00: Protective Coatings
- G. Section 09 96 56: Epoxy Linings and Coatings
- H. Section 31 23 33: Trenching and Backfilling
- I. Section 33 05 31: Piping Joint Materials
- J. Section 33 08 11: Pressure Testing

1.3 SYSTEM DESCRIPTION

- A. Furnish and install ductile-iron pressure pipe as shown on Plans including appurtenant fittings and connections in conformance with Manufacturer's installation requirements and in compliance with applicable construction safety codes and standards.

1.4 STANDARD SPECIFICATIONS

- A. Except as otherwise indicated in this Section of the Specifications, the CONTRACTOR shall comply with the 2015 Standard Specifications for Public Works Construction (SSPWC) Greenbook/Whitebook, as specified in Specification Section 01 09 00-1.2(E).

1.5 SPECIFICATIONS AND STANDARDS

- A. Except as otherwise indicated, the current editions of the following apply to the WORK of this Section:
 - 1. AWWA C110/ANSI A21.10 Ductile-Iron and Gray-Iron Fittings
 - 2. AWWA C150/ANSI A21.50 Thickness Design of Ductile-Iron Pipe
 - 3. AWWA C151/ANSI A21.51 Ductile Iron Pipe, Centrifugally Cast
 - 4. AWWA C153/ANSI A21.53 Ductile-Iron Compact Fittings
 - 5. ANSI/AWWA C203 Coal-Tar Protective Coatings and Linings for Steel Water Pipelines – Enamel and Tape – Hot Applied

6. ANSI/AWWA C213 Fusion-Bonded Epoxy Coating for the Interior and Exterior of Steel Water Pipelines
7. ASTM D16 Standard Terminology for Paint, Related Coatings, Materials, and Applications
8. ASTM D471 Test Method for Rubber Property – Effect of Liquids
9. ASTM D2240 Test Method for Rubber Property – Durometer Hardness
10. ASTM D4060 Test Method for Abrasion Resistance of Organic Coatings by Taber Abraser
11. ASTM D4541 Method for Pull-Off Strength of Coatings using Portable Adhesion Testers
12. ASTM E96 Test Methods for Water Vapor Transmission of Materials
13. ASTM G14 Test Method for Impact Resistance of Pipeline Coatings (Falling Weight Test)
14. NAPF 500-3 Surface Preparation Standard for Ductile Iron Pipe and Fittings in Exposed Locations Receiving Special External Coatings and/or Special Internal Linings
15. References herein to “SSPC Specifications” or “SSPC” shall mean the published standards of the Steel Structures Painting Council, 800 Trumbull Drive, Pittsburgh, PA 15205 (877.281.7772).
16. References herein to “NACE” shall mean the published standards of the National Association of Corrosion Engineers, 15835 Park Ten Place, Houston, TX 77084 (281.228.6200).

1.6 SHOP DRAWINGS AND SAMPLES

- A. The following shall be submitted in compliance with Section 01 30 00:
 1. Certified dimensional drawings of all pipe, valves, fittings, and appurtenances.
 2. Pipe line layout and marking diagrams which indicate the specific pipe, fitting, coupling and valve locations and lengths to be provided at each of the SPS sites. Layout shall include sizes, joint type and the direction of each fitting in the completed line.

1.7 OWNER'S MANUAL

- A. The following shall be included in the OWNER'S MANUAL in compliance with Section 01 30 00:
 1. A certified affidavit of compliance for pipe and other products or materials with the requirements of this Section.

1.8 MARKING, HANDLING, AND STORAGE

- A. Markings: All pipes shall be factory marked indicating size and class. Legibly mark specials 24 inches in diameter and larger in accordance with the laying schedule and marking diagram. Mark the surface of each fitting and special that is intended to be at the top when the fitting or special is placed in the trench.

1.9 PAYMENT

- A. Payment for Work in this section shall be included as part of the lump-sum for Bid Item No. 1.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Pipe and Fittings: Ductile iron pipe and fittings shall be in accordance with SSPWC, Subsection 209-1 and the requirements contained herein. The pipe shall be pressure class 350 and of the diameter indicated.

2.2 PIPE JOINTS

- A. Ductile iron pipe joints shall comply with the requirements of SSPWC, Subsection 209-1 and shall be of the type indicated. Flange gaskets shall be per SSPWC Section 209-1.
- B. Restrained joints shall be an approved type provided and recommended by the pipe manufacturer.

2.3 MATERIALS

- A. Ductile Iron Pipe: Pipe materials shall conform to the requirements of SSPWC, Subsection 209-1, and AWWA C151.
- B. Polyethylene Sleeves: Polyethylene sleeves shall not be used.
- C. Wax-Tape: Wax-tape shall conform to the requirements of Section 09 90 00.

2.4 SPECIAL FITTINGS

- A. Fittings of the compact type for ductile iron pipe shall conform to the requirements of AWWA C153/ANSI A21.53, and shall have a minimum pressure rating of 250 psi.
- B. Fittings shall be of the diameter shown in the Specifications or the Plans. Compact type fittings shall only be used where expressly specified.

2.5 FUSION-BONDED EPOXY COATING AND LINING FOR DUCTILE IRON PIPE

- A. General: Ductile iron pipe, fittings, and specials shall be lined and coated with fusion bonded epoxy in accordance with Section 09 90 00. Except as described below, the material system for the exterior and interior of ductile iron pipe and fittings installed underground or underwater shall be in accordance with ANSI/AWWA C213. Buried

ductile iron pipe and fittings shall also be wrapped in a 3 part wax tape coating system per Section 09 90 00.

- B. Minimum Pipe Diameter: The minimum pipe diameter for application of an internal lining shall be 4 inches.
- C. Maximum Temperature: This material system shall be able to withstand a maximum service temperature of 1900 F.
- D. Thickness: The powder shall be applied to the preheated pipe at a uniform cured thickness. The minimum uniform cured thickness of the applied material shall be as follows:
 - 1. Interior: 24 mils MDFT
 - 2. Exterior: 24 mils MDFT
 - 3. Maximum thickness shall be determined by the applicator based on the roughness of the pipe so as to obtain a holiday free product. Lining and coating thickness for pipe joints shall be compatible with the pipe dimensional tolerances.
- E. Degassifying:
 - 1. The pipe and fittings shall be heated to between 4250 F and 4750F and held at that temperature for 60 minutes or until total outgassing is achieved.
- F. Blast Cleaning:
 - 1. The pipe surfaces to be covered in the plant shall be blast-cleaned with steel grit to achieve a near white surface conforming to SSPC SP10 or NACE TM-01-70 grade NACE No.1, as applicable to ductile iron pipe. Surface preparation shall be in accordance with NAPF 500-3.
- G. Continuity Tests for Coatings with Thickness Exceeding 20 Milis:
 - 1. Interior of pipe shall be electrically inspected at the factory for continuity at 3000 volts. At the option of the RESIDENT ENGINEER, if the number of holidays exceeds one per 3 linear feet of pipe 20 inches O.D. or smaller, or one per 2 linear feet of pipe over 20 inches O.D., the pipe shall be reprocessed. Unless reprocessed, all defects disclosed by the holiday detector shall be repaired in the shop according to Subsection 3.4 - Coating Repair of ANSI/AWWA C213.
 - 2. Exterior of pipe shall be electrically inspected at the factory for continuity at 3000 volts. If the number of holidays exceeds one per 3 linear feet of pipe 20 inches in O.D. or smaller or one per 2 linear feet of pipe over 20 inches O.D., the RESIDENT ENGINEER will determine if the pipe coating shall be removed and reapplied or if holidays shall be repaired in the shop. Shop repairs shall be performed similar to the procedures in ANSI/AWWA C213.
- H. Qualifications, Approval, and Documentation of Fusion Bond Epoxy Manufacturers
 - 1. Qualifications: The fusion bond epoxy manufacturer shall have a record of at least one application of the proposed coating/lining material on a successfully

performing ductile iron piping installation of comparable size and complexity constructed in the recent past.

2. Approval:
 - a. Bidders shall submit the name and documented qualifications of the manufacturer proposed for the fusion bond epoxy material. The OWNER will review and approve the proposed selection.
 - b. Documentation to be submitted by CONTRACTOR
 - (1) Documentation of at least one ductile iron pipe project constructed in the recent past and successfully performing under similar service conditions.
 - (2) The name, telephone number, and address of the owner and completion date and location for the project listed above.
 - (3) The name, telephone number, and address of the firm which applied the fusion bond epoxy in the project listed above.
 - (4) Descriptive literature, including Material Safety Data Sheet, for the proposed material.

PART 3 - EXECUTION

3.1 INSTALLATION OF PIPE

- A. Ductile iron pipe shall be installed in accordance with the applicable provisions of SSPWC, Section 306, and the recommendations of the manufacturer.
- B. Apply wax-tape to all fusion-bonded epoxy coated buried couplings, fittings, valves and flanged joints in accordance with Section 09 90 00 and the recommendations of the manufacturer.

3.2 FIELD TESTING FOR COATING CONTINUITY

- A. All exterior surface coatings, except for cement mortar, shall be inspected electrically immediately before the pipe is lowered into the trench, following the same requirements for factory inspection procedure and voltage indicated above for the protective material. All holidays shall be repaired before the pipe is placed in the trench.

**** END OF SECTION ****

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SECTION 33 32 15
MOTOR-DRIVEN SELF-PRIMING WASTEWATER PUMPS FOR PUMP ROOM

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Materials, testing, and permanent installation in the Pump Room of two motor-driven self-priming baseplate-mounted wastewater pumps, complete with all appurtenances and accessories. These pumps will be replacements for the existing 100 hp Gorman Rupp Model T10A3S-B motor-driven self-priming wastewater pumps (Pumps #1 and #2) that will be removed as part of this contract.
- B. Contractor shall also furnish a third motor-driven self-priming baseplate-mounted wastewater pump for future installation and use by the City. Contractor shall deliver this third (spare) pumping unit to a City-owned storage site to be designated by the City. This unit shall also be furnished with appurtenances and accessories as needed for a complete and functional pumping unit when installed.
- C. All three new wastewater pumps shall be the product of the same manufacturer and shall be of the same type and model, and have the same design operating characteristics. These new pumps shall provide the same design operating performance as the existing Gorman Rupp pumps.
- D. New Pumps #1 and #2 shall be installed subsequent to the bypass pumping system being placed into operation.

1.2 RELATED WORK

- A. Section 01 30 00: Contractor Submittals
- B. Section 01 40 00: Quality Control
- C. Section 01 53 00: Protection of Existing Facilities
- D. Section 01 55 00: Site Access and Storage
- E. Section 01 60 00: Products, Materials, Equipment and Substitutions
- F. Section 09 90 00: Protective Coatings
- G. Section 09 96 56: Epoxy Linings and Coatings
- H. Section 33 01 30: Sewage Bypassing

1.3 EXISTING WASTEWATER PUMPS IN PUMP ROOM

- A. The following information is furnished to inform the Contractor of the pumps that are presently at the Lift Station. The City's intention is to replace these pumps with pumping units of similar type, similar size and similar performance to the existing units (indicated performance per Paragraph 1.3C below is based on the assumption that the existing pumps are performing in the "like-new" condition which recent field tests have indicated is not the case).
- B. The existing Pumps #1 and #2 are Gorman Rupp Model T10A3S-B self-priming baseplate-mounted pumping units. Each pump is belt-and-sheave driven with a 100 HP motor. The rated performance of the existing pumps is: 2,000 gpm at 107 feet

TDH. Pumps operate at constant speed. Detailed information regarding the existing pumps is provided below:

- Pump Suction Flange: 10 inch diameter
- Pump Discharge Flange: 10 inch diameter
- Impeller Type: Semi-open, two vane impeller suitable for 3-inch diameter maximum spherical solids.
- Pump impeller diameter is 14.75 inches.
- Pump speed is 1440 rpm.
- Motor speed is 1800 rpm (nominal).

C. Pumps operate as Lead and Lag, with that designation controlled by the Pump Control Panel, and provide the following theoretical pumping capacity (assuming pumps are in Like-New condition):

- One Pump ON: 2,400 to 2,600 gpm at 100 to 105 feet TDH
- Two Pumps ON: 3,200 to 3,400 gpm at 115 to 120 feet TDH

D. A flow test was performed on the existing pumps on September 2, 2015. That measured pumping rate for each pump is summarized below:

- Pump #1 ON: 1,745 gpm
- Pump #2 ON: 2,045 gpm

Psomas' theoretical analysis of pump station performance suggests both pumps are worn, and are not providing "Like-New" performance. This flow test also indicates existing Pump #1 is providing significantly less flow capacity than Pump #2 (most likely due to its impeller having more damage/wear). Despite the reduced capacity of the existing pumps, one pump ON is still adequate for peak inflow rates that the City's flow data indicates does not typically exceed 1,500 gpm.

The original pumps were installed in 1986. Since then, at least one of the existing pumps has been replaced with a new Gorman Rupp Model T10A3S-B pump, and the other pump may have had its original impeller assembly replaced.

1.4 EXISTING FORCE MAIN AND IN-STATION PIPING

A. Basic information about the discharge force main and in-station piping follows:

- Force Main diameter is 16 inch. The force main is PVC pipe.
- Force Main Length is 2,180 feet (approx.). A profile of this forcemain is provided on contract drawing G-6, along with other engineering information pertinent to calculating the required pump head.
 - Highpoint #1 elevation is 510.55 feet.
 - Highpoint #2 elevation is 503.58 feet.
 - Discharge Manhole (downstream of Highpoint #2): Invert Elevation is 497.95 feet.
- Suction piping is 10-inch diameter ductile iron. Note: the vertical portion of the suction piping has been sleeved with 8-inch diameter PVC pipe to eliminate air leaks in the corroded ductile iron piping.
- Discharge piping is 10-inch diameter ductile iron.
- Discharge header is 16-inch diameter ductile iron.
- The pump floor elevation is 454.00 feet.
- Approximate pump centerline elevation is 456.0 feet.

- B. The City's operating experience for this lift station indicates that one pump ON handles the daily fluctuation of inflow rate (from minimum to peak) without a need to operate two pumps in parallel.
- C. The existing drywell has space for a total of four pumps. However, only Pumps #1 and #2 were originally installed. Suction and discharge pipe connections for future Pumps #3 and #4 were originally installed, but those two pumping units have never been installed. The City does not intend to install a third or fourth pump as part of this project. However the City does intend to purchase a third pumping unit as a spare (for future installation by City forces).

1.5 EXISTING WETWELL AND PUMP CONTROL LEVELS

- A. The pumps installed in the Pump Room take suction from the wetwell that is located below the Pump Room. Approximately 5 feet of the suction piping is horizontal, then it turns downward 90 degrees, penetrates the Pump Room floor, and extends downward to the wetwell. A 90 degree bend at the bottom of each suction pipe allows the pump to take suction from a location that is near the wetwell floor elevation of 432.00 feet.
- B. Key elevations and existing Pump Control Levels (i.e., water levels within the wetwell that initiate pump control or alarms) are summarized below (also refer to contract drawings M-3 and M-4):
 - Approximate Grade of PS Site: 473.00 feet
 - Approximate Pump Centerline: 456.00 feet
 - Pump Room Floor: 454.00 feet
 - Level Sensor "Zero" Reading: 446.00 feet
 - Wetwell Landing (from outside stairs): 446.00 feet
 - Float Switch (for HHHWL): 444.75 feet
 - HHWL: 444.50 feet
 - Influent Sewer Invert to Wetwell: 443.61 feet
 - HWL: 443.50 feet
 - Second Pump Call: 441.83 feet
 - First Pump Call: 441.17 feet
 - Stop all Pumps: 440.17 feet
 - LWL: 438.00 feet
 - Top of Fillet: 438.00 feet
 - LLWL: 437.83 feet
- C. The new pumps shall be able to operate (including priming) given the pump control levels identified above; and the design pumping rate shall be provided when the wetwell water level is at LWL as defined above.
- D. The existing level sensor that provides water level measurement for pump control is a Pulsar Model Ultra 5 with db15 transducer. This device is mounted to the underside of the Pump Room floor near the existing manhole frame and cover assembly that is near Pump #2 (the most southerly of the two existing pumps). This device has an adjustable "deadband" which has been set to provide a "zero" reading when water level in the wetwell is at elevation 446.00 feet. This level sensor will continue to be used as part of the modified pump station, and Contractor shall protect it in-place.

1.6 PUMP ROOM CLASSIFICATION

- A. Because there are two penetrations in the Pump Room floor that provide access to the wetwell below, the City has determined that this room is a Class 1, Division 1, Group D hazardous area for electrical equipment. Thus, the new pumps shall have explosion-proof motors, and all associated electrical features shall be similarly rated.

1.7 PROPOSED SUBSTITUTES OR "OR EQUAL" PUMPS (ALSO REFER TO SECTION 01 60 00)

- A. Whenever materials or equipment are indicated in the Contract Documents by using the name of a proprietary item or the name of a particular Supplier and/or Manufacturer, the naming of the item is intended to establish the type, function, and quality required. Unless expressly prohibited, materials or equipment of other suppliers and/or manufacturers MAY BE accepted if SUFFICIENT information is submitted by the Contractor to the Owner for his exclusive review to determine that the material or equipment proposed is equivalent or equal to that named, subject to the following requirements:
 - 1. The burden of proof as to the type, function, and quality of any such substitute product, material or equipment shall be upon the Contractor.
 - 2. The Owner will be the sole judge as to the type, function and quality of any such substitute, and the Owner's decision shall be final.
 - 3. The Owner may require the Contractor to furnish at the Contractor's expense additional data about the proposed substitute.
 - 4. The Owner may require the Contractor to furnish at the Contractor's expense a special performance guarantee, or other surety, with respect to any substitute.
 - 5. Acceptance by the Owner of a substitute item proposed by the Contractor shall not relieve the Contractor of the responsibility for full compliance with the Contract Documents and for adequacy of the substitute product.
 - 6. The Contractor shall be responsible for resultant changes including design and construction changes and any and all additional costs resulting from the changes which the accepted substitution requires in the Contractor's work, the work of its subcontractors, vendors, and of other contractors, and shall effect such changes without cost to Owner.
- B. The procedure for review by the Owner will include the following:
 - 1. If the Contractor wishes to provide a substitute pump, the Contractor shall make written application to the Owner on the Substitution Request Form. This form will be provided by Owner.
 - 2. The Substitution Request Form(s) shall be submitted within the stipulated period prior to the award of the contract.
 - 3. Wherever a proposed substitute pump has not been submitted within said period, or wherever the submission of a proposed substitute material or equipment has been judged to be unacceptable by the Owner, the Contractor shall provide the material or equipment indicated in the contract documents.
 - 4. The Contractor shall certify that the proposed substitute will perform adequately the functions and achieve the results called for by the general design, and be similar and of equal substance to that indicated, and be suited to the same use as that specified.

5. The Owner will evaluate each proposed substitute within a reasonable period of time.
 6. As applicable, no shop drawing submittals shall be made for a substitute item nor shall any substitute item be ordered, installed, or utilized without Owner's prior written acceptance of the Contractor's Substitution Request Form.
 7. Owner will track the time required by the contract documents for Contractor to propose substitutions, and for the Owner to evaluate proposed substitutions, and in making changes by the Contractor in the contract documents occasioned thereby. Whether or not the Owner accepts a proposed substitute, the Contractor shall reimburse Owner for the charges of the Owner and Engineer to evaluate each proposed substitute.
- C. The Contractor's application using the Substitution Request Form shall contain the following statements and information which shall be considered by the Owner in evaluating the proposed substitute:
1. The evaluation and acceptance of the proposed substitute will not prejudice the Contractor's achievement of substantial completion on time.
 2. Whether or not acceptance of the substitute pump for use in the Work will require a change in any of the contract documents to adopt the design to the proposed substitute.
 3. Whether or not incorporation or use of the substitute in connection with the Work is subject to payment of any license fee or royalty.
 4. All variations of the proposed substitute from the items originally specified will be identified.
 5. Available maintenance, repair, and replacement service will be indicated. The manufacturer shall have a local service agency within 50 miles of the site, which maintains properly trained personnel and adequate spare parts and is able to respond and complete repairs within 24 hours.
 6. Itemized, detailed estimate of ALL costs that will result directly or indirectly from acceptance of such substitute, including cost of redesign and claims of other contractors affected by the resulting change.

1.8 PUMP CONTROL VARIABLES

- A. Pump station control system input control variables shall conform to what the existing pump control panel and associated controls presently implement. Contractor shall refer to the electrical drawings for control information and shall confirm pump control requirements with Owner prior to ordering the new pumps.

1.9 QUALITY ASSURANCE

- A. All pumps furnished shall originate from ISO 9001:2008-certified facility, with scope of registration including design control and service after sales activities.
- B. The pump manufacturer must be registered to the ISO 14001 Environmental Management System standard and as such is committed to minimizing the impact of its activities on the environment and promoting environmental sustainability by the use of best management practices, technological advances, promoting environmental awareness and continual improvement.

C. Certified Performance Curves: Factory testing to produce certified performance curves shall be performed by the pump manufacturer and not by a second party through which the pumping units are marketed in the USA.

D. Factory testing shall include:

ITEM	TEST FOR	TEST STANDARD (ASTM OR OTHER TEST STANDARD)	FREQUENCY	FIRST TEST PAID FOR BY	RETESTS PAID FOR BY
Pump and Motor Assembly	Compliance with Purchase Order	Verify impeller, motor rating & connections comply with Contract Documents	1 each pump assembly	Contractor	Contractor
	Dynamic Balance	NEMA Method MGI 12.06	1 each pump assembly	Contractor	Contractor
	Factory Test and Factory-Certified Pump Curve	Non-Witnessed running test per Hydraulic Institute Standards	One 30-minute test to prepare 6-point curves for each pump assembly. On variable speed pumps, test each pump & prepare 6-point curves at four 100 rpm increments.	Contractor	Contractor
	Vibration	As needed to satisfy pump Manufacturer pumps will pass field tests described in Part 3 below.			
	Ragging	Pumps shall successfully pass 2 Clorox brand "Heavy Duty Reusable" Handi-Wipes, dropped into wet well without ragging	1 test on prototype (Furnished pumps will be tested in field to the extent such testing is feasible)	Contractor	Contractor

E. Witness testing is not required.

F. In-lieu of witness testing, submit test records from factory.

G. Testing shall be performed after final connection of pump and after completion of static and dynamic balancing.

H. If vibration levels fall outside of acceptable limits established by Hydraulic Institute for the type of pumps furnished, then shut down pump and correct for vibration before further testing.

I. The manufacturer of the motor-driven self-priming pumping system shall submit references associated with at least three prior installations similar to what will be furnished for this project.

- J. The manufacturer of the motor-driven self-priming pumps shall accept system responsibility to furnish a complete pumping system that provides the performance required per these contract documents.

1.10 REFERENCES

- A. ANSI/AFBMA 9 Load Ratings and Fatigue Life for Ball Bearings
- B. ANSI/AFBMA 11 Load Ratings and Fatigue Life for Roller Bearings
- C. ANSI B16.1 Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125 and 250
- D. ANSI HI 1.6 Centrifugal Pump Tests
- E. ASTM A36 Carbon Structural Steel
- F. ASTM A48 Gray Iron Castings
- G. AWWA C550 Protective Epoxy Interior Coatings for Valves and Hydrants
- H. California Building Code (CBC)
- I. Hydraulic Institute Standard for Centrifugal, Rotary and Reciprocating Pumps.
- J. NEMA/ANSI 250 Enclosures for Electrical Equipment (1000 Volts Maximum)
- K. NFPA 70 National Electric Code

1.11 SUBMITTALS

- A. Furnish the following submittals.

SUBMITTAL	DESCRIPTION	
Shop Drawings	Required for pumps. Show volutes, impellers, drive assemblies, shafts, bearings, seals, and shaft guards per equipment shop drawing requirements. Show fabrication, assembly, foundation and installation requirements. Show lining and coating data and thicknesses.	
Catalog Data	Required per catalog data requirements. Submit pretest pump curves with specified operating points marked. To the extent applicable for portable pumps, performance curve shall also show moment of inertia of complete pumping unit, required submergence and NPSHR	
Installation Instructions	Required per installation instruction requirements.	
O & M Instructions	Required per operation and maintenance instruction requirements.	
Certificate of Compliance	Submit pump system certification per certificate of compliance requirements. Submit coating system and application certification per certificate of compliance requirements. In lieu of factory ragging test, Contractor may submit letter from Manufacturer certifying pumps being furnished have been designed and verified to pass solids and rags, including spheres up to specified diameter, Clorox brand "Heavy Duty Reusable Handi-Wipes", and other commercial household products of similar construction, size, and durability without ragging the impeller or clogging the pump. Include statement that Manufacturer understands pumps are being purchased in reliance on this promise and that Manufacturer's warranty covers pumping of these materials.	
Manufacturer's Statement of Responsibility	Required per Manufacturer's Statement of Responsibility requirements. Include statement pumps installed comply with Contract Documents.	
Test Record Transcripts	Before shipping pumps, submit certified pump curves for factory tests per Test Record Transcript requirements. Where variable speed drives are provided, submit certified pump curves in 100-rpm increments throughout pump	

SUBMITTAL	DESCRIPTION	
	operating range. Include written report stating date and location pumps were tested and certifying pump curves are accurate and meet specifications.	
	Before shipping pumps, submit certified vibration test report including test results and modal shape signature results stating pump and motor assembly has been tested and vibration falls within limits allowed by HI 1.6, HI 2.6 and above. Note: ignore this provision if the furnished pumps are portable and not firmly mounted to a concrete pad..	
Testing procedures	Submit written test procedures in advance of all field pump tests.	
Warranty	Furnish 5-year warranty from date of final acceptance for all units. Warranty shall bear appropriate serial numbers.	

- B. Refer to Section 01 30 00 for definition of requirements for shop drawings, catalog data, installation instructions, O&M instructions, certificates of compliance, Manufacturer's statements of responsibility, and test record transcripts.

1.12 DELIVERY, STORAGE AND HANDLING

- A. Refer to contract documents for delivery, storage, and handling requirements.
- B. Manufacturer's instruction and warranty requirements for delivery, storage and handling of pumps shall be strictly followed.

1.13 PAYMENT

- A. Payment for Work in this section shall be included as part of the lump-sum for Bid Item No. 1.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Acceptable Manufacturers include:

ITEM	MANUFACTURER	MANUFACTURER LOCATION
Base-plate mounted Electric Motor-Driven Self-Priming Wastewater Pumps	Gorman Rupp, Model T10A3S-B with 100 hp explosion-proof motor	Mansfield, Ohio
	Or accepted equal.	
Electric Motors	By pump Manufacturer	

2.2 GENERAL REQUIREMENTS

- A. Pumps furnished shall operate throughout their full submitted pump curve driven by attached motors.

- B. Contractor and pump vendor shall confirm the furnished pump will provide the intended bypass performance, prior to manufacturing the pumping units. Contractor shall submit calculations showing pump performance curve versus discharge pressure versus suction lift to demonstrate to Owner that the pump is suitable per contract requirements.

2.3 MATERIALS

- A. Pumps must be designed to handle raw, unscreened, domestic sanitary sewage. Pumps shall have 10" suction connection, and 10" discharge connection. Each pump shall be selected to perform under following operating conditions:

- | | |
|--------------------------------------|---|
| 1. Capacity (GPM): | 2,000 gpm |
| 2. Total Dynamic Head (FT): | 107 feet TDH |
| 3. Total Dynamic Suction Lift (FT): | As required for lift station layout and pump control levels defined above |
| 4. Maximum Re-priming Lift (FT): | As required for lift station layout and pump control levels defined above |
| 5. Maximum Static Suction Lift (FT): | As required for lift station layout and Pump control levels defined above |
| 6. Minimum Submergence Depth (FT): | As recommended by Pump Manufacturer |

- B. Pump Performance Certifications:

1. Solids Handling Capability
 - a. All internal passages, impeller vanes, and recirculation ports shall pass a 3" spherical solid. Smaller internal passages that create a maintenance nuisance or interfere with priming and pump performance shall not be permitted. Upon request from the Engineer, manufacturer's certified drawings showing size and location of the recirculation port(s) shall be submitted for approval.

- C. Re-prime Performance:

1. Consideration shall be given to the sanitary sewage service anticipated, in which debris is expected to lodge between the suction check valve and its seat, resulting in the loss of the pump suction leg, and siphoning of liquid from the pump casing to the approximate center line of the impeller. Such occurrence shall be considered normal, and the pump must be capable of automatic, unattended operation with an air release line installed.
2. During unattended operation, the pump shall retain adequate liquid in the casing to insure automatic re-priming while operating at its rated speed in a completely open system. The need for a suction check valve or external priming device shall not be required.
3. Pump must be capable of re-prime given the pump control levels that are defined above and given the pump station layout shown in the Contract Drawings. Re-prime capability shall be based on the worst-case Pump Start condition. Re-prime lift is defined as the static height of the pump suction

above the liquid, while operating with only one-half of the liquid remaining in the pump casing. The pump must re-prime and deliver full capacity within five minutes after the pump is energized in the re-prime condition. Re-prime performance must be confirmed with the following test set-up:

- a. A check valve to be installed downstream from the pump discharge flange. The check valve size shall be equal (or greater than) the pump discharge diameter.
- b. A length of air release pipe shall be installed between the pump and the discharge check valve. This line shall be open to atmosphere at all times duplicating the air displacement rate anticipated at a typical pump station fitted with an air release valve.
- c. The pump suction check valve shall be removed. No restrictions in the pump or suction piping will prevent the siphon drop of the suction leg. Suction pipe configuration for re-prime test shall incorporate a 5 feet minimum horizontal run (to match actual pump layout), a 90o elbow and vertical run at the specified lift. Pipe size shall be equal to the pump suction diameter.
- d. Impeller clearances shall be set as recommended in the pump service manual.
- e. Repeatability of performance shall be demonstrated by testing five consecutive re-prime cycles. Full pump capacity (flow) shall be achieved within five minutes during each cycle.
- f. Liquid to be used for re-prime test shall be water.
- g. Upon request from the Engineer, certified re-prime performance test results, prepared by the manufacturer, and certified by a registered professional engineer, shall be submitted for approval prior to shipment.

D. Certified Pump Performance Test:

1. Tests shall be conducted in accordance with Hydraulic Institute Standards 14.6.3.4 Acceptance Grade 2B at the specified head, capacity, rated speed and horsepower. The performance tests will validate the correct performance of the equipment at the design head, capacity and speed.

E. Manufacturer's Warranty:

1. The pump manufacturer shall warrant the pump equipment to be of quality construction, free of defects in material and workmanship. A written warranty shall include specific details described below.
2. All equipment, apparatus, and parts furnished shall be warranted for sixty (60) months (i.e. five years), excepting only those items that are normally consumed in service, such as oils, grease, packing, gaskets, O-rings, etc. The pump manufacturer shall be solely responsible for warranty of the

pump equipment and all components.

3. Components failing to perform as specified by the Engineer, or as represented by the manufacturer, or as proven defective in service during the 5-year warranty period, shall be replaced, repaired, or satisfactorily modified by the manufacturer.
4. It is not intended that the pump manufacturer assume liability for consequential damages or contingent liabilities arising from failure of any vendor supplied product or part which fails to properly operate, however caused. Consequential damages resulting from defects in design, or delays in delivery are also beyond the manufacturer's scope of liability.
5. This limited warranty shall be valid only when installation is made and use and maintenance is performed in accordance with manufacturer recommendations. The warranty shall become effective on the date of acceptance by the purchaser or the purchaser's authorized agent, or sixty (60) days after installation, successful performance testing in the field by Contractor, and Owner's acceptance of the installed pumps; or after Owner has placed the pumping units into operation in lieu of continued operation of the bypass pumping system (signifying substantial completion as well as the City's acknowledgement that the pumps are capable of reliable operation).

2.4 PUMPING UNIT MANUFACTURER

- A. The specifications and project drawings depict equipment and materials manufactured by The Gorman-Rupp Company which are deemed most suitable for the service anticipated. It is not intended, however, to eliminate other products of equal quality and performance. The Contractor shall prepare his bid based on the specified equipment for purposes of determining low bid. Award of a contract shall constitute an obligation to furnish the specified equipment and materials.
- B. In order to unify responsibility for proper operation, it is the intent of these Specifications that all system components be furnished by a single supplier (unitary source) and that source shall be the pump manufacturer. The pumps must be of standard catalog design, totally warranted by the manufacturer. Under no circumstances will a system consisting of parts compiled and assembled by a manufacturer's representative or distributor be accepted.
- C. Manufacturer must show proof of original product design and testing. Products violating intellectual property regulations shall not be allowed, as they may violate international law and expose the user or engineer to unintended liabilities. "Reverse-engineered" products fabricated to substantially duplicate the design of original product shall not be allowed, as they may contain substantial differences in tolerances and material applications addressed in the original design, which may contribute to product failure.
- D. The term "pump manufacturer" shall be defined as the entity which designs, machines, assembles, hydraulically tests and warranties the final product. Any entity that does not meet this definition will not be considered a "pump manufacturer and is not an acceptable supplier. For quality control reasons and future pump and parts

availability, all major castings of the pump shall be sourced and machined in North America.

- E. After execution of the contract, the Contractor may offer substitutions to the specified equipment for consideration. The equipment proposed for substitution must be superior in construction and performance to that specified in the contract, and the higher quality must be demonstrated by a list of current users of the proposed equipment in similar installations.
- F. In event the Contractor obtains engineer's approval for equipment substitution, the Contractor shall, at his own expense, make all resulting changes to the enclosures, buildings, piping or electrical systems as required to accommodate the proposed equipment. Revised detail drawings illustrating the substituted equipment shall be submitted to the Engineer prior to acceptance.
- G. It will be assumed that if the cost to the Contractor is less for the proposed substitution, then the contract price shall be reduced by an amount equal to the savings.

2.4 PUMP DESIGN

- A. Pumps shall be horizontal, self-priming centrifugal type, designed specifically for handling raw, unscreened, domestic sanitary sewage. Pump solids handling capability and performance criteria shall be in accordance with requirements per this specification section.
- B. Pump Motors: Pump motors shall be of explosion-proof design suitable for a Class 1, Division 1 environment, and shall not exceed 100 horsepower nameplate rating.
- C. Materials and Construction Features:
 - 1. Pump casing shall be cast iron Class 30 with integral volute scroll. Casing shall incorporate the following features:
 - a. Mounting feet sized to prevent tipping or binding when pump is completely disassembled for maintenance.
 - b. Fill port cover plate, 3 1/2" diameter, shall be opened after loosening a hand nut/clamp bar assembly. In consideration for safety, a clamp bar screw must provide slow release of pressure, and the clamp bar shall be retained by detente lugs. A Teflon gasket shall prevent adhesion of the fill port cover to the casing.
 - c. Casing drain plug shall be at least 1 1/4" NPT to insure complete and rapid draining.
 - d. Liquid volume and recirculation port design shall be consistent with performance criteria listed in this specification section.
 - 2. Suction Head shall be Class 30 cast iron. Its design must incorporate following maintenance features:

- a. The suction head will be secured to the pump casing by using hex head cap screws and lock washers. Access to the impeller and mechanical seal shall be accomplished by removing the suction head.
 - b. Removal of any blockages in the impeller shall be accomplished by removing the suction head, or through a cleanout cover on the suction head. In consideration of safety, two clamp bar screws must provide slow release of pressure on two clamp bars securing the cleanout cover. A Teflon gasket shall prevent adhesion of the cleanout cover to the suction head casing.
 - c. Removal of the suction check valve shall be accomplished through the removable cleanout cover on the suction head.
 - d. In consideration for safety, a pressure relief valve shall be supplied in the suction head. The relief valve shall open at 75-200 PSI.
 - e. A replaceable ductile iron wear plate shall be secured up against the pump casing by the suction head. Measurement of the clearance between this wear plate and impeller shall be accomplished through the cleanout cover plate.
3. Rotating assembly, which includes impeller, shaft, mechanical shaft seal, lip seals, bearings, seal plate and bearing housing, must be removable as a single unit without disturbing the pump casing or piping. Design shall incorporate following features:
- a. Seal plate and bearing housing shall be cast iron Class 30. Separate oil filled cavities, vented to atmosphere shall be provided for shaft seal and bearings. Cavities must be cooled by the liquid pumped. Three lip seals will prevent leakage of oil.
 - 1) The bearing cavity shall have an oil level sight gauge and fill plug check valve. The clear sight gauge shall provide easy monitoring of the bearing cavity oil level and condition of oil without removal of the fill plug check valve. The check valve shall vent the cavity but prevent introduction of moist air to the bearings.
 - 2) The seal cavity shall have an oil level sight gauge and fill/vent plug. The clear sight gauge shall provide easy monitoring of the seal cavity oil level and condition of oil without removal of the fill/vent plug.
 - 3) Double lip seal shall provide an atmospheric path providing positive protection of bearings, with capability for external drainage monitoring.
 - b. Impeller shall be ductile iron, two-vane, semi-open, non-clog, with integral pump out vanes on the back shroud. Impeller shall thread

onto the pump shaft and be secured with a lock screw and conical washer.

- c. Impeller shaft shall be AISI 17-4 pH stainless steel.
 - d. Bearings shall be anti-friction ball type of proper size and design to withstand all radial and thrust loads expected during normal operation. Bearings shall be oil lubricated from a dedicated reservoir. Pump designs which use the same oil to lubricate the bearings and shaft seal shall not be acceptable.
 - e. Shaft seal shall be cartridge oil lubricated mechanical type. The stationary and rotating seal faces shall be tungsten titanium carbide alloy. Each mating surface shall be lapped to within three light bands flatness (35 millionths of an inch), as measured by an optical flat under monochromatic light. The stationary seal seat shall be double floating by virtue of a dual O-ring design; an external O-ring secures the stationary seat to the seal plate, and an internal O-ring holds the faces in alignment during periods of mechanical or hydraulic shock (loads which cause shaft deflection, vibration, and axial/radial movement). Elastomers shall be viton; cage and spring to be stainless steel. Seal shall be oil lubricated from a dedicated reservoir. The same oil shall not lubricate both shaft seal and shaft bearings. Seal shall be warranted in accordance with requirements per this specification section.
 - f. Pusher bolt capability to assist in removal of rotating assembly. Pusher bolt threaded holes shall be sized to accept same cap screws as used for retaining rotating assembly.
4. Adjustment of the impeller face clearance (distance between impeller and wear plate) shall be accomplished by external means.
- a. Clearances shall be maintained by using external shims between the casing ring of the rotation assembly and the pump casing itself. Shims will be of various sizes to allow precise adjustment of this clearance. The clearance can be measured by removing the cleanout cover on the suction head.
 - b. Clearance adjustment which requires movement of the shaft only, thereby adversely affecting seal working length or impeller back clearance, shall not be acceptable.
5. Suction check valve shall be molded Neoprene with integral steel and nylon reinforcement. A blow-out center shall protect pump casing from hydraulic shock or excessive pressure. Removal or installation of the check valve must be accomplished through the cleanout cover on the suction head without disturbing the suction piping. Sole function of check valve shall be to save energy by eliminating need to re-prime after each pumping cycle. Pumps requiring a suction check valve to assist re-prime will not be acceptable.

6. Removal of the rotating assembly will be accomplished through the front or the back of the pump casing.
7. Continuous Vane Impeller with Self-Cleaning Wear plate:
 - a. The nature of the conveyed medium poses significant challenges to the continuous operation of the pump. Of particular concern is the clogging of the impeller by debris in the pumped medium including but not limited to long rags, fibers, and like debris which are able to wrap around the impeller vanes, stick to the center of the vanes or hub, or lodge within the spaces between the impeller and the housing.
 - b. The pump impeller shall be a continuous vane extending from one edge of the impeller through the central portion of the impeller to the other edge. The impeller height shall increase continuously from the outer radius of to the central region of the impeller.
 - c. The matching wear plate shall have one or more notches and/or recesses provided along a common diameter of the wear plate to disturb and dislodge any solids which might otherwise remain on the impeller in dynamic operation. Clusters of notches and/or recesses may also be provided.

D. Serviceability:

1. The pump manufacturer shall demonstrate to the Engineer's satisfaction that consideration has been given to reducing maintenance costs.
2. No special tools shall be required for replacement of any components within the pump.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Contractor shall off-load equipment at installation site using equipment of sufficient size and design to prevent injury or damage. Immediately after off-loading, Contractor shall inspect complete pump and appurtenances for shipping damage or missing parts. Any damage or discrepancy shall be noted in written claim with shipper prior to accepting delivery. Validate all pump serial numbers and parts lists with shipping documentation. Notify the manufacturer's representative of any unacceptable conditions noted with shipper.

3.2 PREPARATION

- A. Make field measurements needed to install pumps before submitting shop drawings or ordering. Make minor changes in dimensions and alignments as needed to avoid utilities or structural conflicts.

3.3 INSTALLATION: GENERAL REQUIREMENTS

- A. Furnish and install pumps at location shown on Plans and Submittals.
- B. The following installation standards shall be followed:
 - 1. Manufacturer's installation and warranty requirements
 - 2. Applicable OSHA and Cal OSHA regulations
 - 3. Applicable building, fire, plumbing, and electrical code requirements
- C. Refer variances between above documents and Contract Documents to Owner's Representative.
- D. Install pumps to tolerances recommended by Manufacturer. Unless otherwise shown, install pumps true, plumb, and level using precision gauges and levels.

3.4 INSTALLATION: DETAILED REQUIREMENTS

- A. Install, level, align, and lubricate pump(s) as indicated on project drawings. Installation must be in accordance with written instructions supplied by the manufacturer at time of delivery.
- B. Suction pipe connections shall be vacuum tight. Fasteners at all pipe connections must be tight. Install pipe with supports and thrust blocks to prevent strain and vibration on pump piping. Install and secure all service lines (level control, air release valve or pump drain lines) as required in wet well.
- C. Check motor and control data plates for compatibility to site voltage. Install and test the station ground prior to connecting line voltage to control panel.
- D. Prior to applying electrical power to any motors or control equipment, check all wiring for tight connection. Verify that protective devices (fuses and circuit breakers) conform to project design documents. Manually operate circuit breakers and switches to ensure operation without binding. Open all circuit breakers and disconnects before connecting utility power. Verify line voltage, phase sequence and ground before actual start-up.
- E. After all anchor bolts, piping and control connections are installed, completely fill the grout dam in the pump station base with non-shrink grout.

3.5 OPERATIONAL TEST

- A. Prior to acceptance by Owner, an operational test of all pumps, drives, and control systems shall be conducted to determine if the installed equipment meets the purpose and intent of the specifications. Tests shall demonstrate that all equipment is electrically, mechanically, structurally, and otherwise acceptable; it is safe and in optimum working condition; and conforms to the specified operating characteristics.
- B. After construction debris and foreign material has been removed from the wet well, contractor shall supply clear water volume adequate to operate station through

several pumping cycles. Observe and record operation of pumps, suction and discharge gauge readings, ampere draw, pump controls, and liquid level controls. Check calibration of all instrumentation equipment, test manual control devices, and automatic control systems. Be alert to any undue noise, vibration or other operational problems.

3.6 FIELD QUALITY CONTROL

A. Field testing shall include:

ITEM	TEST FOR	TEST STANDARD (ASTM OR OTHER TEST STANDARD)	FREQUENCY	FIRST TEST PAID FOR BY	RETESTS PAID FOR BY
Pumps	5-Day field performance test to demonstrate compliance to Contract Documents and Manufacturer's printed literature	Hydraulic Institute Standards. Tests shall be witnessed by pump supplier's factory authorized representative who shall certify that installed pumping system complies with Contract Documents and Manufacturer's warranty requirements and that no drive equipment is overloaded.	1 Test (successfully performed)	Contractor	Contractor
	Ragging	Field-installed pumps shall successfully pass 2 Clorox brand "Heavy Duty Reusable" Handi-Wipes dropped into wet well without ragging impeller.	3 tests each pump	Contractor	Contractor
	Passing Sphere	Field-installed pumps shall successfully pass tennis ball or similar spherical object of size specified.	2 tests each pump	Contractor	Contractor
	Vibration	Running test with vibration analyzer per ANSI/HI 1.6 and ANSI/HI 2.6 Do not exceed published HI standards or 0.20 in/sec RMS in absence of HI standards.	1 test each pump during six-hour field performance test Test each pump at four 100 rpm increments.	Contractor	Contractor
	Installation, Noise, Odors, Heat and Leakage	Visual inspection of finished installation	1 inspection	Owner	Contractor
	11-month Warranty Inspection	Demonstrate compliance to Contract Documents and Manufacturer's printed literature	1 test	Owner	Contractor

ITEM	TEST FOR	TEST STANDARD (ASTM OR OTHER TEST STANDARD)	FREQUENCY	FIRST TEST PAID FOR BY	RETESTS PAID FOR BY
	59-month Warranty Inspection	Demonstrate compliance to Contract Documents and Manufacturer's printed literature	1 test	Owner	Contractor

- B. Provide services of factory-authorized representative on-site to witness and inspect startup of pump operation. Before startup, check all equipment for proper lubrication, alignment, rotation, freedom from excessive vibration. Factory-authorized representative shall notify Contractor and Owner of any irregularities of installation which might render Manufacturer's warrantee null and void.
- C. Conduct field performance test in presence of Owner's Representative and Owner's personnel after at least 24 hours of field operation have occurred to burn in system.
- D. In event field performance tests show excessive vibration or fail to demonstrate compliance with requirements of Contract Documents or certified curves furnished, Owner shall have right to either:
 - 1. Decline acceptance of failing pumps and require Contractor to replace them or
 - 2. Deduct agreed upon allowance for Owner's incremental cost of additional power from payment due Contractor.

3.7 FIELD TRAINING OF OWNER'S PERSONNEL

- A. In addition to the above, provide services of pump Manufacturer's factory-authorized representative on-site for at least 8 man-hours (travel time excluded) to provide classroom instruction of Owner's personnel in proper recommended lubrication, operation and maintenance procedures as well as procedures for proper lockout out of each energy source.
- B. The following handouts shall be provided by Manufacturer's factory-authorized representative to all attendees during classroom instruction:
 - 1. Listing of any actions (or inactions) by Owner which would render Manufacturer's warranty null and void.
 - 2. Written description of proper lubrication procedures.
 - 3. Written list of all required scheduled maintenance including recommended service intervals to ensure warrantee remains valid and to ensure equipment remains functional.
 - 4. Written description of procedures for lockout of each energy source.

3.8 SPARE PARTS

- A. Furnish the following spare parts for each pump:

QUANTITY	PART
1	Mechanical seal
1	Pump impeller
2	Sets of all gaskets and O-rings
1	Duplicate nameplate for each pump and motor provided

** END OF SECTION **

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**SECTION 40 91 19
PRESSURE GAUGE ASSEMBLIES**

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. This section includes materials, testing, and installation of pressure gauge assemblies.
- B. Pressure gauges shall be provided for the suction and discharge piping of Pumps #1 and #2 as indicated by the contract drawings.

1.2 RELATED WORK

- A. Section 01 30 00: Contractor Submittals
- B. Section 01 40 00: Quality Control
- C. Section 01 53 00: Protection of Existing Facilities
- D. Section 01 55 00: Site Access and Storage
- E. Section 01 60 00: Products, Materials, Equipment and Substitutions

1.3 DESCRIPTION OF PRESSURE GAUGE ASSEMBLY

- A. Furnish and install complete, a suction gauge (rated for full vacuum) and pressure gauge (0 to 160 psi) for each sewage pump. Pressure gauges shall indicate pressure (or vacuum), and are **not** intended to provide an analog (e.g. 4 to 20 mA) signal for remote pressure indication or pump control. Each pair of gauges shall be mounted to a pressure gauge stand, and shall include the following appurtenances:
 - A threaded pipe boss (0.5" NPT) on the ductile iron spool to be monitored by each pressure gauge.
 - Two small diameter ball valves: one at the pipe tap and the other near the pressure gauge.
 - A diaphragm seal (near the pipe tap); with 0.5-inch diameter connection for connection to the pipe tap nipple, and a 0.25-inch diameter connection for the flexible hose.
 - A 0.25-inch diameter flexible stainless steel braided hose to connect the pressure gauge to the pressure tap
 - A pressure gauge stand for each pair of pressure gauges.
 - Pipe nipples, couplings and miscellaneous connectors, anchor bolts and other appurtenances as required for a complete and functional assembly.
- B. Install all equipment at the locations indicated by the Contract drawings, and in conformance with the manufacturer's recommendations and applicable standards.

1.4 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workmen trained and experienced in necessary trades and crafts and completely familiar with specified requirements and methods for proper performance of Work of this section.

1.5 REFERENCES

- A. ASME/ANSI B16.5 Steel Pipe Flanges and Flanged Fittings (Including ratings for Class 150, 300, 400, 600, 900, 1500, and 2500)
- B. ASME/ANSI B40.100 Pressure Gauges and Attachments
- C. AWWA C207 Steel Pipe Flanges
- D. California Plumbing Code (CPC)
- E. NEMA/ANSI 250 Enclosures for Electrical Equipment
- F. NFPA 70 National Electric Code
- G. NSF/ANSI 61 Drinking Water System Components – Health Effects

1.6 SUBMITTALS

- A. Furnish the following submittals.

SUBMITTAL	DESCRIPTION	
Shop Drawings	Required per equipment shop drawing requirements	
	Required for pressure instruments under electrically controlled equipment shop drawing requirements	
Catalog Data	Required per catalog data requirements	
Installation Instructions	Required per installation instruction requirements	
O & M Instructions	Required per operation and maintenance instruction requirements	
Warranty	Furnish one-year warranty from date of final acceptance	

- B. Refer to Section 01 30 00 for definition of requirements for shop drawings, catalog data, installation instructions, and O&M instructions.

1.7 DELIVERY, STORAGE AND HANDLING

- A. Refer to contract documents for delivery, storage, and handling requirements.
- B. Manufacturer’s instruction and warranty requirements for delivery, storage and handling of Pressure Instruments shall be strictly followed.

1.8 PAYMENT

- A. Payment for Work in this section shall be included as part of the lump-sum for Bid Item No. 1.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Acceptable Manufacturers for stem-mount pressure gauges include:

ITEM	MANUFACTURER	MANUFACTURER LOCATION
Pressure Gauges – Stem-Mounted Bourdon Tube Type (for suction and	Ashcroft Type 1279 Duragauge (liquid filled) with 0.25-inch diameter stem / lower connection. P/N: 45-1279SSL-02L	Stratford, CT
	-or- Ashcroft Type 1279 Duragauge (dry gauge with	Stratford, CT

ITEM	MANUFACTURER	MANUFACTURER LOCATION
discharge gauges)	"Plus Performance" option)) with 0.25-inch diameter stem / lower connection. P/N: 45-1279SSL-02L-XLL	
	Accepted Equal	

B. Acceptable Manufacturers for diaphragm-seal include:

ITEM	MANUFACTURER	MANUFACTURER LOCATION
Diaphragm Seal (for suction and discharge pressure gauges)	Ashcroft Type 201 welded or bonded diaphragm seal; Threaded with Flushing Connection P/N: 50-201SS-02T-XCK with 0.5" nipple and Apollo Isolation Valve	Stratford, CT
	Accepted Equal	

C. Acceptable Manufacturers for Pressure Gauge Assembly Accessories include:

ITEM	MANUFACTURER	MANUFACTURER LOCATION
Item #1: Flexible Hose for Pressure Gauge	Ashcroft Type 1115A Armored capillary (fill with Silicone or manufacturer-recommended equivalent product suitable for the application) Length of capillary shall be 7.5 to 10 feet as required for the indicated installation.	Stratford, CT
Item #2: Stainless Steel Ball Valve	Apollo 76-100 Series: <ul style="list-style-type: none"> • 0.5-inch diameter (at pipe tap) • 0.25-inch diameter (at pressure gauge) 	Matthews, NC
Item #3: Pressure Gauge Stand (Stainless Steel Fabrication)	Pipeline Products (Part No. PS-23T: Quote 18271) (note: Contractor shall drill mounting holes in the pressure gauge backboard as required for the gauge installation)	San Marcos, CA
	Accepted Equal for each of the above-listed items	

2.2 MATERIALS

- A. Refer to Section 01 60 00 for basic requirements for products and materials.
- B. Stem-mount pressure instruments shall be constructed of the following materials:

ITEM	MATERIAL	SPECIFICATION
Bourdon Tube Type Gauge	Case	Black Phenolic, Solid Front
	Process-Wetted Materials (Bourdon Tube)	SAE Type 316 Stainless Steel
	Window	Acrylic
	Sleeve	Pure Gum Rubber
	Fill Fluid	Halocarbon (unless a pressure fluctuation-damped dry gauge is furnished as specified above)
Diaphragm Seal	Case	Type 316 Stainless Steel
	Diaphragm	Metal diaphragm welded to the top housing; or elastomeric diaphragm bonded to the top housing.

C. The following product design criteria, options and accessories are required:

ITEM	DESCRIPTION	
Pressure Gauges – Stem-Mounted Bourdon Tube Type	Style	Liquid-filled with dampers, stem-mounted Comply with ASME/ANSI B40.100
	Calibrated Pressure Range	Suction Gauge: Full-Vacuum Discharge Gauge: 0 to 160 psi
	Accuracy within Flow Range	±0.5% of calibrated span (ASME B40.100 Grade 2A)
	Fluid Metered	Raw Sewage upstream of diaphragm seal; and silicon fill downstream of the diaphragm seal.
	Fluid Temperature Range	32-90°F
	Stem Connection	¼" NPT
	Indicator Units	Manufacturer's standard units for specified pressure range.
	Dial Size	4.5"
	Readout	Suction Gauge: inches of Hg Discharge Gauge: psi
	Adjustable Dampening Wheel	Required

PART 3 - EXECUTION

3.1 PREPARATION

- A. Make field measurements needed to install pressure gauges before submitting shop drawings or ordering. Make minor changes in dimensions and alignments as needed to avoid utilities or structural conflicts.

3.2 INSTALLATION

- A. Furnish and install pressure gauges at locations shown on Plans and Submittals.
- B. The following installation standards shall be followed:
1. Manufacturer's installation and warranty requirements

2. Applicable OSHA and Cal OSHA regulations
 3. California Plumbing Code Chapter 6 "Water Supply and Distribution" Section 609.8 "Low Pressure Cutoff Required on Booster Pumps for Water Distribution Systems"
 4. Other applicable building, fire and plumbing code requirements
- C. Refer variances between above documents and Contract Documents to Owner's Representative.

3.3 FIELD QUALITY CONTROL

- A. Field testing shall include:

ITEM	TEST FOR	TEST STANDARD (ASTM OR OTHER TEST STANDARD)	FREQUENCY	FIRST TEST PAID FOR BY	RETESTS PAID FOR BY
Pressure Instruments	Installation & Leakage	Visual inspection of finished installation	1 inspection	Owner	Owner
	Field Performance	Demonstrate compliance to Contract Documents and Manufacturer's printed Literature	1 test	Contractor	Contractor
	Integration with Owner's Telemetry	Verify successful operation with telemetry.	As directed	Contractor	Contractor
	11-month Warranty Inspection	Demonstrate compliance to Contract Documents and Manufacturer's printed literature	1 test	Owner	Contractor

3.4 ADJUSTING AND CLEANING

- A. Provide services of Manufacturer's representative as needed for startup, inspection and necessary adjustments as needed for a complete and functional pressure gauge installation.

** END OF SECTION **

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SECTION 41 22 33 TROLLEY HOISTS

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Materials, testing, and installation of a trolley hoist inside the Pump Room. The new trolley and hoist will be installed on an existing steel beam that previously supported a one-ton rated Yale trolley and hoist.
- B. The existing Yale trolley and hoist and appurtenances will be removed by Contractor. The existing trolley is geared type, and is chain operated. The existing hoist is motorized with a pendant controller. Information regarding the existing hoist, trolley and beams, are taken from the original design drawings and from a copy of the approved shop drawing that was prepared during original construction in 1986. It is Psomas' understanding that the existing hoist, trolley, and beams conform to what is known about original construction. Contractor shall verify existing conditions as part of his scope of work.
- C. The new hoist and trolley will each be manually operated by pull chain.

1.2 RELATED WORK

- A. Section 01 30 00: Contractor Submittals
- B. Section 01 40 00: Quality Control
- C. Section 01 53 00: Protection of Existing Facilities
- D. Section 01 55 00: Site Access and Storage
- E. Section 01 60 00: Products, Materials, Equipment and Substitutions
- F. Section 05 50 00: Metal Fabrications
- G. Section 09 90 00: Protective Coatings

1.3 SYSTEM DESCRIPTION

- A. Furnish and install complete operating trolley hoist including appurtenant structural, mechanical and connections required for compliance with Manufacturer's installation requirements and compliance with applicable building codes and standards.
- B. The new hoist and trolley will be mounted to an existing S10x25.4 steel beam which functions as a boom. This existing beam (or boom) is straight, but it is hinged where it mounts against the Pump Room wall. That existing hinged support allows the straight beam (or boom) to swivel. The Pump Room dimensions and layout allow the existing boom to swivel along an approximate 105 degree arc. Boom movement along its operating arc is guided by an existing Craneveyor Model CV 4036 two-wheel trolley that is mounted to an existing curved track formed by a S8x18.4 steel beam (beam radius is 17.75 feet). The existing S10 steel beam (straight boom) and existing S8 steel beam (curved track) will remain; they will not be demolished.
- C. The existing hoist and trolley are a one-ton rated Yale Geared Trolley Type electric chain hoist (Yale Model KEL 1-12GT-15S1). This unit provides a 12 feet maximum vertical lift, and with a 1.0 hp motor provides a maximum lifting rate of 15 feet per

minute. The existing hoist was specified to be suitable for H1 duty (per HMI specifications). The existing trolley is moved along the boom by means of an existing manual chain drive. The existing hoist uses chain for lifting loads. An existing tagline provides power to the existing motorized hoist. The existing hoist has a pendant that hangs down from the hoist for ease of use.

- D. Original Structural Design Parameters (for 1986 construction): The new hoist and trolley are intended to fit the existing boom, have the same design capabilities, and provide the same performance as the existing hoist/trolley/boom system did when it was first installed. A detailed description of the existing hoist/trolley/boom system is provided below to assist the Contractor with selection of new components.

Per the original specification used for construction in 1986, the crane/hoist system was designed to meet the following design parameters:

1. Design of assemblies were based on the use of a factor of safety of 5, with capacity load, on all mechanical parts of the system; the factors of safety were based on the ultimate strength of the material used.
2. Calculation of all structural members included an allowance for vertical impact of twenty-five percent (25%) of total live load, and an allowance for a lateral impact of twenty percent (20%) of the combined weight of the hoist, trolley and live load.
3. Live load deflection of any fully loaded runway beam would not exceed 1/450 of the span.
4. Calculations for beam stresses included all live loads, dead loads, and live load impact, and generally followed the method of calculating stresses as specified by the American Institute of Steel Construction.
5. Calculations assumed the hoist is loaded in the most critical position.
6. Per the original shop drawing (SD #8) the calculated design load for the jib crane assembly was determined to be:
 - Live Load 2,000 lbs
 - 25% Impact 500 lbs
 - Hoist & Trolley 185 lbs
 - Dead Weight (Boom) 250 lbs
 - Dead Weight (Track) 100 lbs
 - Total Design Load = 3,025 lbs
7. Per the original shop drawing (SD #8) the original design calculations indicate two (2) ¾-inch diameter anchors (carrying 1,517.5 pounds of load each) were used at each of six points where the S8 beam is connected to the Pump Room ceiling. Those anchors are embedded in the ceiling roof slab (which is 12-inches thick). At each of the six points of attachment, the S8 beam is connected to a steel base plate using two 5/8-inch diameter Grade 5 machine bolts.

- E. The City has recently determined that the Pump Room is a Class 1, Division 1 (Group D) hazardous area per the National Electrical Code. Because of that determination, the existing hoist and trolley will be removed and replaced with a non-motorized hoist

and trolley that is designed to be suitable for use in a Class 1, Division 1 (Group D) area.

- F. The Pump Room has been subjected to odorous gases that have leaked into this space via the existing floor hatches, other floor penetrations, and perhaps also the existing floor drain. The long-term exposure to that H2S-contaminated environment may have compromised the structural integrity of the hoist system (including anchorage). Contractor shall inspect the existing hoist/monorail system with the goal of determining if the monorail system (boom, etc.) remain capable of accepting original design loads as indicated in Paragraph 1.3D above. Contractor shall report his findings and recommendations to the Resident Engineer. Should repairs be authorized by the City, they shall be implemented as a Field Order (for additional compensation) in conformance with contract requirements.
- G. Subsequent to installing the new hoist and trolley system (and subsequent to making any City-authorized repairs to the underlying monorail/boom system, Contractor shall load test the new lifting system (hoist and trolley) in conformance with regulatory agency and code requirements.

1.4 REFERENCES

- A. California Building Code (CBC)
- B. California Fire Code (CFC)
- C. Hoist Manufacturers Institute (HMI) Standards
- D. ASME/ANSI B30.11 Monorails and Underhung Cranes
- E. ASME/ANSI B30.16 Overhead Hoists (Underhung)
- F. ASTM A36 Carbon Structural Steel
- G. ASTM A992 Structural Steel Shapes
- H. California Building Code (CBC)
- I. California Fire Code (CFC)
- J. MMA Specification for Underhung Cranes and Monorail Systems
- K. Monorail Manufacturers Association (MMA) Standards

1.5 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workmen trained and experienced in necessary trades and crafts and completely familiar with specified requirements and methods for proper performance of Work of this section.
- B. Factory testing shall conform to manufacturer's standard requirements.

1.6 SUBMITTALS

- A. Furnish the following submittals.

SUBMITTAL	DESCRIPTION	
Shop Drawings	<p>Required per equipment shop drawing requirements.</p> <p>Shop drawings shall show relative elevations of crane hooks versus equipment hooks and lifting lugs for furnished pumps, motors, valves and other equipment to be lifted by furnished hoists. Verify dimensional compatibility. Verify that all equipment fits within structural spaces available.</p>	

SUBMITTAL	DESCRIPTION	
Catalog Data	Required per catalog data requirements.	
Installation Instructions	Required per installation instruction requirements.	
O & M Instructions	Required per operation and maintenance instruction requirements.	
Engineering Calculations	Required for any variances from Contract Drawings per engineering calculations requirements.	
Manufacturer's Statement of Responsibility	Manufacturer shall confirm the furnished products are suitable for the existing trolley beam, and shall confirm their hoist and trolley are rated for the specified lifting requirements.	
Structural Capacity of Lifting System	Manufacturer shall examine the existing crane beams (straight boom and curved track) and points of attachments, to confirm that the load carrying capacity of the existing beams and new trolley hoist are adequate for the design one-ton capacity for which the modified system is to be rated. Submit calculations and other information as needed to document this analysis.	
Warranty	Furnish 3-year warranty from date of final acceptance	

- B. Refer to Section 01 30 00 for definition of requirements for shop drawings, catalog data, installation instructions, O&M instructions, engineering calculations, and Manufacturer's statements of responsibility.

1.7 DELIVERY, STORAGE AND HANDLING

- A. Refer to contract documents for delivery, storage, and handling requirements.
- B. Manufacturer's instruction and warranty requirements for delivery, storage and handling of trolley hoists shall be strictly followed.

1.8 PAYMENT

- A. Payment for Work in this section shall be included as part of the lump-sum for Bid Item No. 1.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Acceptable Manufacturers include:

ITEM	MANUFACTURER	MANUFACTURER LOCATION
Hoist and Trolley Equipment	Chester Hoist Div of Columbus McKinnon Model #1312-1 Chester Zephyr Army Type Trolley Hoist: <ul style="list-style-type: none"> • 1-Ton Rated Capacity • 12 feet vertical lift capability • Chain Container • Spark Resistant Design Features 	Salem, MI
	Accepted equal	

- B. To simplify maintenance, all moving or rolling parts shall be standard products of one Manufacturer modified as needed to meet Contract requirements.

2.2 MATERIALS

- A. Refer to Section 01 60 00 for basic requirements for products and materials.
- B. The following design criteria, product options and accessories are required:

ITEM	DESCRIPTION	
Manual Traveling Hoist	Lifting Capacity	1-ton
	Design Factor of Safety	5.0 based on yield strength of material used
	Lift Height	12.0 feet
	Type	Chain
	Operation	Geared
Coating	Epoxy	See Section 09 90 00.
	Color	OSHA Safety Yellow

- C. Hoists shall comply with HMI 100 and shall be single-reeved or double-reeved, single-cable or dual-cable as recommended by hoist Manufacturer for this application. All hoists shall have load brakes. Gears shall be forged and hardened steel running in sealed oil bath. Gear shafts shall have ball or roller bearings. Hoist cable shall be chain. Load block shall be enclosed with ductile iron or steel sheeves mounted on bearings. Hooks shall be drop forged or heat-treated with hook latches standard.
- D. The new trolley hoist shall be a one-ton capacity Chester Catalog No. 1312-0100SR, Zephyr army type geared trolley hoist with 12 feet of lift, 10 feet of hand chain drop, and shall be complete with zinc plated load chain and hand chain, and shall be suitable to operate on the existing S10x25.4 steel beam (boom); or approved equal. Provide a chain Container. Hoist shall be painted OSHA Safety Yellow. Spark resistant features shall include (but not necessarily be limited to):
- Aluminum hand chain,
 - Aluminum trolley hand chain guard
 - Stainless steel load chain
 - Bronze hook with stainless steel latch
 - Bronze bottom block
 - Bronze brake ratchet
 - Bronze trolley wheels

PART 3 - EXECUTION

3.1 PREPARATION

- A. Make field measurements needed for proper installation of the new trolley hoist on the existing steel beam (boom) before submitting shop drawings or ordering. Notify Engineer if there are existing conditions that will preclude installation of the new trolley hoist to conform to manufacturer's recommendations. Also, notify Engineer if there are safety concerns about use of the existing boom and curved track (including

points of attachment) that might impact the safe use of this new lifting system to its design load rating of one-ton lifting capacity at any point along its arc of movement.

3.2 INSTALLATION

- A. Furnish and install trolley hoists at locations shown on Plans and Submittals.
- B. The following installation standards shall be followed:
 - 1. Manufacturer’s installation and warranty requirements
 - 2. Applicable OSHA and Cal OSHA regulations
 - 3. Applicable building, fire, plumbing, mechanical and electrical code requirements
- C. Refer variances between above documents and Contract Documents to Owner’s Representative.
- D. Install structural steel members and rail systems true and level at location shown on Plans and Submittals using precision gauges and levels.
- E. Manufacturer of the furnished equipment shall provide factory authorized personnel to supervise installation and initial installation.

3.3 FIELD QUALITY CONTROL

- A. Where engines and other heavy equipment is to be installed beneath hoisting equipment, Contractor shall test the hoisting equipment, in place, before installing other equipment whose presence may interfere with test loads used to certify hoisting equipment, rails and runways. It shall be Contractor’s responsibility to provide adequate clearances to allow certifying all hoisting equipment including rails and crane runways.
- B. Field testing shall include:

ITEM	TEST FOR	TEST STANDARD (ASTM OR OTHER TEST STANDARD)	FREQUENCY	FIRST TEST PAID FOR BY	RETESTS PAID FOR BY
Hoist	Operation	Lift 125% of rated load to maximum height from floor level and operate loaded hoist over its maximum travel.	1 test each hoist	Contractor	Contractor
	Certification	Hoist certification company licensed by State of California To provide CMAA 74 testing to produce certificate field tests were performed and installation is adequate for rated load.	1 each hoist	Contractor	Contractor
	Field Performance	Demonstrate compliance to Contract Documents	1 test	Contractor	Contractor

ITEM	TEST FOR	TEST STANDARD (ASTM OR OTHER TEST STANDARD)	FREQUENCY	FIRST TEST PAID FOR BY	RETESTS PAID FOR BY
Hoist and Trolley		and Manufacturer's printed literature			
	11-month Warranty Inspection	Demonstrate compliance to Contract Documents and Manufacturer's printed literature	1 test	Owner	Contractor

C. Provide services of factory authorized representative on-site for at least one man-day (travel time excluded) to provide:

1. Installation assistance, inspection and startup of the complete trolley hoist system.
2. Field testing and adjustment.
3. Instruction of Owner's personnel in operation and maintenance.

**** END OF SECTION ****

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**SECTION 44 31 00
CARBON ADSORBER ODOR CONTROL SYSTEM**

PART 1 – GENERAL

1.1 WORK INCLUDED

- A. This section specifies requirements for an activated carbon adsorber odor control system, including requirements for system construction, components, materials, quality and use.
- B. The equipment supplier shall furnish all labor, materials, equipment and incidentals required for the contractor to install the activated carbon odor control system as shown on the drawings and specified herein.

1.2 RELATED WORK

- A. Section 01 30 00: Contractor Submittals
- B. Section 01 40 00: Quality Control
- C. Section 01 53 00: Protection of Existing Facilities
- D. Section 01 55 00: Site Access and Storage
- E. Section 01 60 00: Products, Materials, Equipment and Substitutions
- F. Section 09 90 00: Protective Coatings

1.3 GENERAL SYSTEM DESCRIPTION:

- A. The entire system shall consist of the following major components:
 - 1. Equipment Skid
 - 2. FRP Exhaust Fan
 - 3. FRP Transition from Fan to Vessel Inlet
 - 4. FRP Inlet Volume Control Damper
 - 5. FRP Carbon Adsorber Vessel
 - 6. Activated Carbon Media (Potassium Hydroxide Impregnated)
 - 7. FRP Electrical Control Panel
 - 8. FRP Exhaust Stack
- B. Inlet ductwork will be provided by the Contractor to collect the foul air and deliver it to the carbon adsorber fan inlet. The ductwork is specified elsewhere and is not part of this specification.

1.4 REFERENCE STANDARDS

- A. PS 15-69: National Bureau of Standards Voluntary Product Standard "Custom Contact Molded Reinforced Polyester Chemical Resistant Process Equipment"
- B. ASTM D-833: "Definition of Terms relating to Plastics"
- C. ASTM D-2583: "Test for Indentaion Hardness of Rigid Plastics by Means of Barcol Impressor."
- D. ASTM D-2563: "Recommended Practice for Classifying Visual Defects in Glass Reinforced Plastic Laminate Parts."
- E. ASTM D-4097-82: "Standard Specifications for Contact Molded Glass Fiber Reinforced Thermoset Resin Chemical Resistant Tanks."

1.5 SYSTEM DESCRIPTION

- A. The activated carbon odor control system shall consist of an exhaust fan, FRP damper, FRP vessel, activated carbon media, control panel, exhaust stack, valves, piping and all other equipment and accessories for a complete system.
- B. All components of the system shall be mounted on the skid.
- C. The skid-mounted carbon adsorber odor control system shall be a “once-through” system. The system is equipped with an exhaust fan that continuously draws the odor-laden air from the process areas into the activated carbon odor control vessel for treatment. The foul air flows through a densely packed bed of potassium hydroxide (KOH) impregnate carbon where hydrogen sulfide (H2S) is removed by adsorption onto the carbon media. The air shall continue through the vessel and cleaned air is discharged to the atmosphere through the stack at the top of the unit. A pre-wired control panel shall be provided to ensure proper control and operation of the system.

- D. The odor control system shall be designed for the following operating conditions:

CHARACTERISTIC	VALUE
Location of Odor System	Sewage PS23T Site in San Diego
Quantity of Odor Systems	One
Model Number	MCS-0400 by IMS, or approved equal
Airflow Rate, CFM	700
Average Inlet H2S Concentration	30 ppm
Peak Inlet H2S Concentration	100 ppm

- E. The odor control system shall provide the following performance:

INLET	OUTLET
If 1 to 10 ppm H2S	0.1 ppm H2S
If >10 ppm	1% of inlet

1.6 DELIVERY, STORAGE AND HANDLING

- A. Refer to contract documents for delivery, storage, and handling requirements.
- B. Manufacturer’s instruction and warranty requirements for delivery, storage and handling of odor control system shall he strictly followed.

1.7 QUALITY ASSURANCE (MANUFACTURER)

- A. All equipment provided under this section shall he obtained from a single manufacturer who shall:
 1. Assume full responsibility for the completeness and proper operation of the activated carbon odor control system.
 2. Have experience; be reputable and qualified in designing and manufacturing activated carbon odor control system equipment.
 3. Supply units containing all necessary appurtenances and components for a complete and operating system conforming to this specification. The entire system shall be skid-mounted, piped, wired, and factory tested prior to shipment to facilitate installation and start-up at the jobsite. The overall

system footprint shall not exceed the dimensions shown on the drawings.

- B. To ensure quality and complete unit responsibility, the complete system must be assembled and tested by the manufacturer at its facility. The manufacturer must have a physical plant, technical and design staff, and fabricating personnel to complete the work specified.
- C. The Owner reserves the right to be present at the manufacturer's facility for visual inspection of equipment to be supplied.
- D. The system manufacturer shall have a service center and capabilities as defined in Section 3.5.

1.8 QUALITY ASSURANCE (CONTRACTOR)

- A. Use adequate numbers of skilled workmen trained and experienced in necessary trades and crafts and completely familiar with specified requirements and methods for proper performance of the Work of this section.

1.9 SPECIFIED MANUFACTURER

- A. The activated carbon odor control system shall be as manufactured and supplied by Integrity Municipal Systems, LLC (IMS), Poway, CA (858.486.1620), or approved equal.
- B. The mechanical, structural, process and electrical design has been based on an activated carbon odor control system manufactured by IMS (Poway, CA). The cost of any changes and modifications to mechanical, structural, electrical and other facilities necessary to adapt alternate equipment to the layout and design shown shall be borne by the Contractor.

1.10 WARRANTY

- A. The manufacturer shall warrant that the equipment provided shall be free of defects in material and workmanship for a period of 18 months from beneficial occupancy. The warranty does not apply to the carbon media.

1.11 PRODUCT SUBMITTALS

- A. The following product data shall be submitted by the activated carbon odor control system manufacturer for review and approval by the Engineer prior to the fabrication of the system.
 1. Shop drawings and catalog literature showing dimensional information, details of piping and fabrication and erection of all materials and equipment furnished under this section.
 2. Drawing of general arrangement and major system components.
 3. Process and Instrumentation drawings.
 4. Calculations showing theoretical anticipated life of carbon media based on anticipated hydrogen sulfide inlet concentration.
 5. Experience and qualifications requirements (Section 1.7)
 6. Service center/manufacturing facility information (Section 3.5)
 7. Resume of factory engineer providing service (Section 3.6)

8. Major system component information and descriptive literature for the following:
 - a. Exhaust fan
 - b. Carbon media MSDS and specification sheet
 - c. Vessel fabrication
 - d. System controls and control panel details including power and control wiring diagrams, terminals, and numbers
 - e. Miscellaneous instrumentation and accessories
 - f. Installation instructions
 - g. Operating weight of all equipment
9. Operation and Maintenance Manuals: This document shall provide detailed information regarding the operation and maintenance of the system. Quantity to be furnished shall conform to contract requirements.

1.12 MANUFACTURER'S SERVICES

- A. The system manufacturer shall be present at the jobsite for the following time period after the system is installed (travel time excluded):
 1. Eight (8) hours for system startup, certification of proper installation and training of Owner's staff in operation of the system.
 2. Provide one trip for one day for these tasks.

1.13 PAYMENT

- A. Payment for Work in this Section shall be included as part of the lump-sum for Bid Item No. 1.

PART 2 – PRODUCTS

2.1 ACTIVATED CARBON ODOR CONTROL SYSTEM

- A. The odor control gas treatment system shall be a once-through activated carbon odor removal system treating the odorous air from the contaminated process areas. The system shall be designed for continuous and automatic operation as well as manual operation as required.
- B. FRP vessel, activated carbon media, exhaust fan, exhaust stack, control panel and all other required appurtenances shall be pre-assembled and mounted on a skid. The entire system shall be pre-assembled on a skid, piped, wired, and factory tested prior to shipment.

2.2 FRP VESSEL

- A. The activated carbon vessel shall be designed for the following design criteria:

CRITERIA	VALUE
Vessel Diameter,	4.0 feet
Vessel Straight Side Height	5.5 feet
Wall Thickness	0.25 inch
Wind Load, mph	As Required by Code
Seismic Zone	As Required by Code
Internal Positive Pressure	+ 10 inches, water column

Maximum Operating Temperature	150 degrees "F"
Carbon Bed Depth	3.0 feet

- B. The activated carbon odor control system shall consist of a round fiberglass reinforced plastic (FRP) vessel.
- C. The activated carbon odor control system shall be manufactured with the following material of construction according to the following method:
1. The vessel shall be fabricated from premium grade vinyl ester resin FRP.
 2. Resin used in fabrication shall be a premium vinyl ester resin such as Hetron 922 or Derakane 411 by Ashland Chemical, Vipel F010 by AOC, or approved equal. The resin shall be reinforced with an inner veil of suitable synthetic organic fiber such as Nexus 111-00010. Any material of construction other than FRP with premium grade resin shall not be acceptable.
 3. Reinforcement: Glass fiber reinforcement used shall be commercial grade corrosion resistant borosilicate glass.
 4. Fabrication:
 - a. General: Fabrication shall be in accordance with NBS PS 15-69, ASTM D3299 and ASTM D-4097. All non-molded surfaces shall be coated with resin incorporating paraffin to facilitate a full cure of the surface. All cut edges, bolt holes, and secondary bonds shall be sealed with a resin coat prior to the final paraffinated resin coat.
 - b. Corrosion Liner: The inner surface of all laminates shall be resin rich and reinforced with one NEXUS 111-00010 with a minimum thickness of 10 mils. The interior corrosion layer shall consist of two layers of 1.5 ounces per square foot chopped strand mat. The total corrosion liner thickness shall be a minimum of 100 mils.
 - c. Structural Laminate: Structural laminates shall consist of alternating layers of 1.5 ounce per square foot mat of chopped glass and 24 ounce per square yard woven roving applied to reach a designed thickness. The exterior shall be surface coated with white gel coat containing ultra-violet light inhibitors.
- D. Fittings: The vessel shall be fitted with the following fittings:

DESCRIPTION	SIZE (inch)	TYPE	QTY
Gas Inlet	10	Flanged	1
Gas Outlet	8	Flanged	1
Drain	1	NPT	1
Pressure Taps	1	NPT	2
Carbon Sample	1	NPT	2
Outlet Air Sample	1	NPT	1

- E. Access Manway or Removable Top: The vessel shall be provided with a completely removable top or a 24-inch diameter access manway.
- F. Exhaust Stack: The carbon absorber system shall be provided with an exhaust

stack manufactured of FRP. The exhaust stack shall be contact molded and manufactured in accordance with NBS PS 15-69 and ASTM D-4097 for contact molding. The resin used in the fabrication of the exhaust stack shall be the same as that used for the main vessel such as Hetron 922 or Derakane 411 by Ashland Chemical, Vipel F010 by AOC, or approved equal.

- G. Media Support and Screen: The carbon adsorber vessel shall be provided with an FRP support grating system with polypropylene screen to accommodate three (3) feet (954 mm) of carbon media bed. The screen and the support system shall be removable through the top cover. The support system shall consist of removable grating. Pall rings or other dumped packing media as a means of carbon support will not be acceptable. The support system shall be designed to withstand a load of at least 150 pounds per square foot, with a minimum deflection of 6 mm under all conditions.
- H. Grounding Rod: A stainless steel rod shall be provided to adequately ground each carbon bed. Rods shall be grounded via a 10-gauge wire.
- I. Carbon Sample Probes: Each vessel shall have two (2) one-inch diameter sample probes per bed which shall extend into the bed a minimum of 12 inches. The sample probes shall be blocked off with a ball valve constructed of PVC.
- J. Differential Pressure Gauge: A series 2000 differential pressure gauge as manufactured by Dwyer Instruments shall be provided to continuously monitor the pressure drop across the carbon bed. The differential pressure gauge shall be isolated with isolation valves and shall be mounted on the vessel.
- K. Hardware and Gaskets: All hardware and anchor lugs shall be Type 316 stainless steel. All bolts shall be designed for the specified loads. Gaskets shall be a minimum of 1/8-inch thick, full face, EPDM, suitable for the intended service.
- L. Anchor Bolts: The carbon adsorber shall be provided with adequately sized epoxy Hilti anchor system.

2.3 ACTIVATED CARBON MEDIA

- A. Type: The activated carbon shall be a coal based, pelletized, Potassium Hydroxide (KOH) impregnated, vapor phase type; suitable for the control of sewage odors.
- B. The activated carbon media shall meet the following specifications:

CHARACTERISTICS	VALUE
MPD, mm	4
Apparent Density, g/cc	0.51 to 0.53
Hardness Number	96 minimum
CTC Activity	60 minimum
H2S Capacity, gH2S/cc	0.14 minimum

2.4 EXHAUST FAN

- A. General: Fan shall be centrifugal design manufactured of FRP with a radial blade wheel. The wheel shall be statically and dynamically balanced. The fan inlet shall be slip type and the fan outlet shall have a flanged nozzle. The shaft shall be Type

304 stainless steel with Teflon shaft seal.

- B. Fan shall be supplied with a TEFC motor with 1.15 service factor, 3 phase, 60 hertz, 480 volts; and shall be explosion-proof for installation in a Class 1, Division 1, Group D environment. The fan shall be belt driven.
- C. Fan housing shall be constructed of fiberglass and reinforced with rigid bracing to increase structural integrity. The fan shall include graphite impregnation for grounding.
- D. Performance: The fan shall be tested and rated in accordance with AMCO and shall bear the AMCA seal.
- E. The fan shall be New York Blower, Hartzell, or equal.
- F. The fan shall be designed for operation with the selected odor control system, and shall have the following performance:

CHARACTERISTICS	VALUE
Odor Control System (basis of design)	IMS Model MCS-0400
Airflow Rate	700 cfm
Static Pressure up to System Inlet	1.0 inch water column
Total Pressure Drop	6.0 inches water column
Motor Size	2.0 hp

2.5 SYSTEM ELECTRICAL CONTROL PANEL

- A. The electrical control panel shall house all required controls for the entire system. The electrical control panel shall be pre-mounted on the system and shall be pre-wired at the factory.
- B. The control panel enclosure shall be rated NEMA 4X and shall be made of FRP. The control panel shall be factory tested to full operation with all other components prior to shipment.
- C. The control panel shall provide electrical control for the entire system. Control functions and accessories shall include, as a minimum, the following features:
 - 1. "Hand-Off-Auto" switch for exhaust fan
 - 2. "Exhaust Fan running" indicator light
 - 3. Exhaust fan motor starter
 - 4. Power disconnect switch
 - 5. Control transformer (480V, 3ph, 60 Hz)
- D. The power supply shall be 480V, 3 phase, 60 hertz.

2.6 EQUIPMENT SKID

- A. The entire system shall be factory assembled on a carbon steel equipment skid to minimize field installation requirements. The skid shall be sand-blasted and coated with a two-part epoxy enamel, with a compatible primer coat.

2.7 PIPING

- A. All piping shall be Schedule 80 PVC.
- B. All above-grade PVC piping that is exposed to the weather and sunlight shall be painted per Specification Section 09 90 00 for protection against UV-degradation.

2.8 INLET DUCTWORK AND DAMPERS

- A. The carbon adsorber manufacturer shall provide the required FRP inlet ductwork to the fan and vessel inlet, within the area of the equipment skid as shown on the drawings. FRP ductwork shall include fan bypass ducting to the system inlet, fan discharge isolation damper, and fan bypass isolation damper.
- B. The carbon adsorber manufacturer shall provide the required FRP transition piece between the fan outlet and the fan discharge isolation damper. The vessel inlet shall include a volume control damper with lockable louver for flow adjustment.

PART 3 – EXECUTION

3.1 GENERAL

- A. Make field measurements needed to install odor control system before submitting shop drawings or ordering. Make minor changes in dimensions and alignments as needed to avoid utilities or structural conflicts.
- B. Furnish and install the odor control system at the location shown on the plans and submittals.
 - 1. Manufacturer's installation and warranty requirements
 - 2. Applicable OSHA and Cal-OSHA regulations
 - 3. Applicable building, fire, plumbing, mechanical and electrical code requirements
- C. Refer variances between the documents listed above and the Contract Documents, to Owner's Representative.
- D. Install odor control system to tolerances recommended by Manufacturer. Unless otherwise shown, install odor control system true, plumb, and level using precision gauges and levels.

3.2 FACTORY ASSEMBLY AND TESTING

- A. Each system shall be pre-assembled at the manufacturing location.
- B. System shall be tested at the location of assembly to assure it is in full operational and working mechanical order.
- C. Factory Testing shall include visual inspection of all equipment, complete assembly and functional operating testing of components including piping and equipment check, and verification of control panel wiring and operation.

- D. Owner or Engineer reserves the right to be present at the manufacturing location for factory witness testing. The Contractor shall include all travel expenses (airfare, hotel, car and meals) for one (1) trip for one (1) day by the Owner or Engineer to the manufacturer's facility in the USA for factory witness testing of the complete system prior to shipment.

3.3 DELIVERY AND INSTALLATION

- A. System shall be packaged and shipped so as not to incur damage to any portion of the system through handling and installation of the system itself.
- B. System shall be installed per the manufacturer's guidelines and recommendations. Installation shall include the re-assembly of any items separately package for protection during shipment. Site preparation, utility service and installation are not provided by the manufacturer under these specifications.
- C. It is the Contractor's responsibility to provide:
1. Piping from the existing wetwell vent (odorous air source) to the fan inlet connection.
 2. Wiring to/from the system control panel to remote-mounted equipment, plant SCADA, etc.(if such connections are included in the overall project design).
 3. Power to system control panel (480V, 3 ph, 60 Hz, 25 amps)
 4. A permanent hard-piped drain from the odor system to the influent manhole (as indicated by the contract drawings).

3.4 FIELD START-UP

- A. A factory representative from manufacturer shall be present at the jobsite for initial system start-up of equipment as specified in Section 1.02F. Factory representative shall assure that system is property installed, and shall startup the system and train Owner's personnel.

3.5 SERVICE CENTER/MANUFACTURING FACILITY

- A. The carbon odor control system manufacturer shall have complete, ongoing service capability with factory trained personnel. The service center/manufacturing facility shall be located in southern California within 50 miles of the jobsite for quick response. The service center/manufacturing facility shall be staffed with at least five (5) full-time employees of the odor control system supplier. A manufacturer's sales representative office and Sales Representative personnel staffing shall not be acceptable.
- B. The service center/manufacturing facility shall be able to provide the following services:
- Field H₂S measurements
 - Airflow rate measurements
 - Provision of replacement parts and operational trouble-shooting

3.6 MONTHLY SERVICES

- A. The carbon odor control system manufacturer shall perform monthly services at the

jobsite during the warranty period. The services shall include a monthly site visit by a factory engineer from the local service center/manufacturing facility for equipment inspection. Only services conducted by a factory engineer are acceptable. Factory engineer shall have intimate familiarity with design and operation of identical carbon systems through documented experience in the odor control industry designing, testing and servicing odor control systems of the size, materials, and scope specified herein. Services conducted by a manufacturer's sales representative or agent are not acceptable.

- B. Each month, all components of the system shall be checked by the factory engineer to verify proper operation and performance. The airflow rate shall be checked and the system's proper operation and performance shall be verified. A report shall be provided for the monthly visits.

3.7 FIELD QUALITY CONTROL

ITEM	TEST FOR	TEST STANDARD (ASTM OR OTHER TEST STANDARD)	FREQUENCY	FIELD TEST PAID FOR BY	RETESTS PAID FOR BY
Odor Control System	Installation & Leakage	Visual inspection of finished installation	1 inspection	Owner	Owner
	Field Performance	Demonstrate compliance to Contract Documents and Manufacturer's printed literature	1 test	Contractor	Contractor
	11-month Warranty Inspection	Demonstrate compliance to Contract Documents and Manufacturer's printed literature	1 test	Owner	Contractor

**** END OF SECTION ****

APPENDIX A
NOTICE OF EXEMPTION

NOTICE OF EXEMPTION

(Check one or both)

TO: X RECORDER/COUNTY CLERK
P.O. BOX 1750, MS A-33
1600 PACIFIC HWY, ROOM 260
SAN DIEGO, CA 92101-2422

FROM: CITY OF SAN DIEGO
PUBLIC WORKS DEPARTMENT
525 B STREET, SUITE 750, MS 908A
SAN DIEGO, CA 92101

OFFICE OF PLANNING AND RESEARCH
1400 TENTH STREET, ROOM 121
SACRAMENTO, CA 95814

PROJECT NO.: B-14131.02.06

PROJECT TITLE: SEWER PUMP STATION 23T IMPROVEMENTS

PROJECT LOCATION-SPECIFIC: The project is located at 1190 Cactus Road, San Diego, CA 92154 within the Otay Mesa Community Planning Area (Council District 8).

PROJECT LOCATION-CITY/COUNTY: San Diego/San Diego

DESCRIPTION OF NATURE, PURPOSE, AND BENEFICIARIES OF PROJECT: This project consists of the following repairs and improvements to Sewer Pump Station 23T: Replacing suction pipes, wet well sluice gate, stem and electric operator with a manual operator; replacing two existing pumps and providing a third uninstalled pump for additional standby service; replacing the dry well electric hoist and trolley; providing continuously operated power wet-well ventilation and odor control; upgrading electrical fixtures in the drywell in order to meet code regarding explosion rated equipment; relocating the motor control center (MCC) from the underground drywell to the outside, on grade; and installation of temporary bypass pumping only during construction.

NAME OF PUBLIC AGENCY APPROVING PROJECT: San Diego/San Diego

NAME OF PERSON OR AGENCY CARRYING OUT PROJECT: City of San Diego Public Works Department,
Contact: Rolf Lee, Project Manager Ph: 619-533-4660
525 B Street, Suite 750, MS 908A, San Diego, CA 92101

EXEMPT STATUS: (CHECK ONE)

- () MINISTERIAL (SEC. 21080(b)(1); 15268);
() DECLARED EMERGENCY (SEC. 21080(b)(3); 15269(a));
() EMERGENCY PROJECT (SEC. 21080(b)(4); 15269 (b)(c))
(X) CATEGORICAL EXEMPTIONS: 15301 EXISTING FACILITIES; 15302 REPLACEMENT OR RECONSTRUCTION; AND 15303 NEW CONSTRUCTION OR CONVERSION OF SMALL STRUCTURES.
() STATUTORY EXEMPTIONS:

REASONS WHY PROJECT IS EXEMPT: The City of San Diego conducted an environmental review and determined that this project meets the criteria set forth in CEQA State Guidelines, Section 15301; which allows for the operation, repair, maintenance, or minor alteration of existing public or private structures, and facilities. The project also meets the criteria set forth in CEQA State Guidelines, Section 15302, which allows for the replacement of existing structures or facilities where the new structure will be located on the same site as the structure replaced and will have substantially the same purpose and capacity as the structure replaced; and Section 15303, which allows for minor alteration of facilities involving a negligible expansion of use, and construction and location of limited numbers of new small facilities or structures. All improvements will occur either inside the existing pump station or on the improved site. Therefore, no significant environmental impacts would occur. In addition the project does not trigger any of the exceptions to categorical exemptions listed in CEQA State Guidelines, Section 15300.2.

LEAD AGENCY CONTACT PERSON: DARREN GENOVA, SENIOR PLANNER TELEPHONE: 619-533-4659

IF FILED BY APPLICANT:

- 1. ATTACH CERTIFIED DOCUMENT OF EXEMPTION FINDING.
2. HAS A NOTICE OF EXEMPTION BEEN FILED BY THE PUBLIC AGENCY APPROVING THE PROJECT?

(X) YES () NO

[Signature of Carrie Purcell]

CARRIE PURCELL, PRINCIPAL PLANNER
Revised March 7, 2016 JA

3/8/16
DATE

APPENDIX B
FIRE HYDRANT METER PROGRAM

CITY OF SAN DIEGO CALIFORNIA DEPARTMENT INSTRUCTIONS	NUMBER DI 55.27	DEPARTMENT Water Department
SUBJECT FIRE HYDRANT METER PROGRAM (FORMERLY: CONSTRUCTION METER PROGRAM)	PAGE 1 OF 10	EFFECTIVE DATE October 15, 2002
	SUPERSEDES DI 55.27	DATED April 21, 2000

1. **PURPOSE**

1.1 To establish a Departmental policy and procedure for issuance, proper usage and charges for fire hydrant meters.

2. **AUTHORITY**

- 2.1 All authorities and references shall be current versions and revisions.
- 2.2 San Diego Municipal Code (NC) Chapter VI, Article 7, Sections 67.14 and 67.15
- 2.3 Code of Federal Regulations, Safe Drinking Water Act of 1986
- 2.4 California Code of Regulations, Titles 17 and 22
- 2.5 California State Penal Code, Section 498B.0
- 2.6 State of California Water Code, Section 110, 500-6, and 520-23
- 2.7 Water Department Director

Reference

- 2.8 State of California Guidance Manual for Cross Connection Programs
- 2.9 American Water Works Association Manual M-14, Recommended Practice for Backflow Prevention
- 2.10 American Water Works Association Standards for Water Meters
- 2.11 U.S.C. Foundation for Cross Connection Control and Hydraulic Research Manual

3. **DEFINITIONS**

3.1 **Fire Hydrant Meter:** A portable water meter which is connected to a fire hydrant for the purpose of temporary use. (These meters are sometimes referred to as Construction Meters.)

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SUBJECT FIRE HYDRANT METER PROGRAM (FORMERLY: CONSTRUCTION METER PROGRAM)	PAGE 2 OF 10	EFFECTIVE DATE October 15, 2002
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3.2 **Temporary Water Use:** Water provided to the customer for no longer than twelve (12) months.

3.3 **Backflow Preventor:** A Reduced Pressure Principal Assembly connected to the outlet side of a Fire Hydrant Meter.

4. POLICY

4.1 The Water Department shall collect a deposit from every customer requiring a fire hydrant meter and appurtenances prior to providing the meter and appurtenances (see Section 7.1 regarding the Fees and Deposit Schedule). The deposit is refundable upon the termination of use and return of equipment and appurtenances in good working condition.

4.2 Fire hydrant meters will have a 2 ½" swivel connection between the meter and fire hydrant. The meter shall not be connected to the 4" port on the hydrant. All Fire Hydrant Meters issued shall have a Reduced Pressure Principle Assembly (RP) as part of the installation. Spanner wrenches are the only tool allowed to turn on water at the fire hydrant.

4.3 The use of private hydrant meters on City hydrants is prohibited, with exceptions as noted below. All private fire hydrant meters are to be phased out of the City of San Diego. All customers who wish to continue to use their own fire hydrant meters must adhere to the following conditions:

a. Meters shall meet all City specifications and American Water Works Association (AWWA) standards.

b. Customers currently using private fire hydrant meters in the City of San Diego water system will be allowed to continue using the meter under the following conditions:

1. The customer must submit a current certificate of accuracy and calibration results for private meters and private backflows annually to the City of San Diego, Water Department, Meter Shop.

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2. The meter must be properly identifiable with a clearly labeled serial number on the body of the fire hydrant meter. The serial number shall be plainly stamped on the register lid and the main casing. Serial numbers shall be visible from the top of the meter casing and the numbers shall be stamped on the top of the inlet casing flange.
3. All meters shall be locked to the fire hydrant by the Water Department, Meter Section (see Section 4.7).
4. All meters shall be read by the Water Department, Meter Section (see Section 4.7).
5. All meters shall be relocated by the Water Department, Meter Section (see Section 4.7).
6. These meters shall be tested on the anniversary of the original test date and proof of testing will be submitted to the Water Department, Meter Shop, on a yearly basis. If not tested, the meter will not be allowed for use in the City of San Diego.
7. All private fire hydrant meters shall have backflow devices attached when installed.
8. The customer must maintain and repair their own private meters and private backflows.
9. The customer must provide current test and calibration results to the Water Department, Meter Shop after any repairs.
10. When private meters are damaged beyond repair, these private meters will be replaced by City owned fire hydrant meters.

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11. When a private meter malfunctions, the customer will be notified and the meter will be removed by the City and returned to the customer for repairs. Testing and calibration results shall be given to the City prior to any re-installation.
 12. The register shall be hermetically sealed straight reading and shall be readable from the inlet side. Registration shall be in hundred cubic feet.
 13. The outlet shall have a 2 ½ “National Standards Tested (NST) fire hydrant male coupling.
 14. Private fire hydrant meters shall not be transferable from one contracting company to another (i.e. if a company goes out of business or is bought out by another company).
- 4.4 All fire hydrant meters and appurtenances shall be installed, relocated and removed by the City of San Diego, Water Department. All City owned fire hydrant meters and appurtenances shall be maintained by the City of San Diego, Water Department, Meter Services.
- 4.5 If any fire hydrant meter is used in violation of this Department Instruction, the violation will be reported to the Code Compliance Section for investigation and appropriate action. Any customer using a fire hydrant meter in violation of the requirements set forth above is subject to fines or penalties pursuant to the Municipal Code, Section 67.15 and Section 67.37.
- 4.6 **Conditions and Processes for Issuance of a Fire Hydrant Meter**
- Process for Issuance
- a. Fire hydrant meters shall only be used for the following purposes:
 1. Temporary irrigation purposes not to exceed one year.

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2. Construction and maintenance related activities (see Tab 2).
 - b. No customer inside or outside the boundaries of the City of San Diego Water Department shall resell any portion of the water delivered through a fire hydrant by the City of San Diego Water Department.
 - c. The City of San Diego allows for the issuance of a temporary fire hydrant meter for a period not to exceed 12 months (365 days). An extension can only be granted in writing from the Water Department Director for up to 90 additional days. A written request for an extension by the consumer must be submitted at least 30 days prior to the 12 month period ending. No extension shall be granted to any customer with a delinquent account with the Water Department. No further extensions shall be granted.
 - d. Any customer requesting the issuance of a fire hydrant meter shall file an application with the Meter Section. The customer must complete a "Fire Hydrant Meter Application" (Tab 1) which includes the name of the company, the party responsible for payment, Social Security number and/or California ID, requested location of the meter (a detailed map signifying an exact location), local contact person, local phone number, a contractor's license (or a business license), description of specific water use, duration of use at the site and full name and address of the person responsible for payment.
 - e. At the time of the application the customer will pay their fees according to the schedule set forth in the Rate Book of Fees and Charges, located in the City Clerk's Office. All fees must be paid by check, money order or cashiers check, made payable to the City Treasurer. Cash will not be accepted.
 - f. No fire hydrant meters shall be furnished or relocated for any customer with a delinquent account with the Water Department.
 - g. After the fees have been paid and an account has been created, the

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meter shall be installed within 48 hours (by the second business day). For an additional fee, at overtime rates, meters can be installed within 24 hours (within one business day).

4.7 Relocation of Existing Fire Hydrant Meters

- a. The customer shall call the Fire Hydrant Meter Hotline (herein referred to as "Hotline"), a minimum of 24 hours in advance, to request the relocation of a meter. A fee will be charged to the existing account, which must be current before a work order is generated for the meter's relocation.
- b. The customer will supply in writing the address where the meter is to be relocated (map page, cross street, etc). The customer must update the original Fire Hydrant Meter Application with any changes as it applies to the new location.
- c. Fire hydrant meters shall be read on a monthly basis. While fire hydrant meters and backflow devices are in service, commodity, base fee and damage charges, if applicable, will be billed to the customer on a monthly basis. If the account becomes delinquent, the meter will be removed.

4.8 Disconnection of Fire Hydrant Meter

- a. After ten (10) months a "Notice of Discontinuation of Service" (Tab 3) will be issued to the site and the address of record to notify the customer of the date of discontinuance of service. An extension can only be granted in writing from the Water Department Director for up to 90 additional days (as stated in Section 4.6C) and a copy of the extension shall be forwarded to the Meter Shop Supervisor. If an extension has not been approved, the meter will be removed after twelve (12) months of use.
- b. Upon completion of the project the customer will notify the Meter Services office via the Hotline to request the removal of the fire hydrant meter and appurtenances. A work order will be generated

CITY OF SAN DIEGO CALIFORNIA DEPARTMENT INSTRUCTIONS	NUMBER DI 55.27	DEPARTMENT Water Department
SUBJECT FIRE HYDRANT METER PROGRAM (FORMERLY: CONSTRUCTION METER PROGRAM)	PAGE 7 OF 10	EFFECTIVE DATE October 15, 2002
	SUPERSEDES DI 55.27	DATED April 21, 2000

for removal of the meter.

- c. Meter Section staff will remove the meter and backflow prevention assembly and return it to the Meter Shop. Once returned to the Meter Shop the meter and backflow will be tested for accuracy and functionality.
- d. Meter Section Staff will contact and notify Customer Services of the final read and any charges resulting from damages to the meter and backflow or its appurtenance. These charges will be added on the customer's final bill and will be sent to the address of record. Any customer who has an outstanding balance will not receive additional meters.
- e. Outstanding balances due may be deducted from deposits and any balances refunded to the customer. Any outstanding balances will be turned over to the City Treasurer for collection. Outstanding balances may also be transferred to any other existing accounts.

5. **EXCEPTIONS**

- 5.1 Any request for exceptions to this policy shall be presented, in writing, to the Customer Support Deputy Director, or his/her designee for consideration.

6. **MOBILE METER**

- 6.1 Mobile meters will be allowed on a case by case basis. All mobile meters will be protected by an approved backflow assembly and the minimum requirement will be a Reduced Pressure Principal Assembly. The two types of Mobile Meters are vehicle mounted and floating meters. Each style of meters has separate guidelines that shall be followed for the customer to retain service and are described below:

- a) **Vehicle Mounted Meters:** Customer applies for and receives a City owned Fire Hydrant Meter from the Meter Shop. The customer mounts the meter on the vehicle and brings it to the Meter Shop for

CITY OF SAN DIEGO CALIFORNIA DEPARTMENT INSTRUCTIONS	NUMBER DI 55.27	DEPARTMENT Water Department
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inspection. After installation is approved by the Meter Shop the vehicle and meter shall be brought to the Meter Shop on a monthly basis for meter reading and on a quarterly basis for testing of the backflow assembly. Meters mounted at the owner's expense shall have the one year contract expiration waived and shall have meter or backflow changed if either fails.

b) **Floating Meters:** Floating Meters are meters that are not mounted to a vehicle. **(Note: All floating meters shall have an approved backflow assembly attached.)** The customer shall submit an application and a letter explaining the need for a floating meter to the Meter Shop. The Fire Hydrant Meter Administrator, after a thorough review of the needs of the customer, (i.e. number of jobsites per day, City contract work, lack of mounting area on work vehicle, etc.), may issue a floating meter. At the time of issue, it will be necessary for the customer to complete and sign the "Floating Fire Hydrant Meter Agreement" which states the following:

- 1) The meter will be brought to the Meter Shop at 2797 Caminito Chollas, San Diego on the third week of each month for the monthly read by Meter Shop personnel.
- 2) Every other month the meter will be read and the backflow will be tested. This date will be determined by the start date of the agreement.

If any of the conditions stated above are not met the Meter Shop has the right to cancel the contract for floating meter use and close the account associated with the meter. The Meter Shop will also exercise the right to refuse the issuance of another floating meter to the company in question.

Any Fire Hydrant Meter using reclaimed water shall not be allowed use again with any potable water supply. The customer shall incur the cost of replacing the meter and backflow device in this instance.

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7. **FEE AND DEPOSIT SCHEDULES**

7.1 **Fees and Deposit Schedules:** The fees and deposits, as listed in the Rate Book of Fees and Charges, on file with the Office of the City Clerk, are based on actual reimbursement of costs of services performed, equipment and materials. These deposits and fees will be amended, as needed, based on actual costs. Deposits, will be refunded at the end of the use of the fire hydrant meter, upon return of equipment in good working condition and all outstanding balances on account are paid. Deposits can also be used to cover outstanding balances.

All fees for equipment, installation, testing, relocation and other costs related to this program are subject to change without prior notification. The Mayor and Council will be notified of any future changes.

8. **UNAUTHORIZED USE OF WATER FROM A HYDRANT**

- 8.1 Use of water from any fire hydrant without a properly issued and installed fire hydrant meter is theft of City property. Customers who use water for unauthorized purposes or without a City of San Diego issued meter will be prosecuted.
- 8.2 If any unauthorized connection, disconnection or relocation of a fire hydrant meter, or other connection device is made by anyone other than authorized Water Department personnel, the person making the connection will be prosecuted for a violation of San Diego Municipal Code, Section 67.15. In the case of a second offense, the customer's fire hydrant meter shall be confiscated and/or the deposit will be forfeited.
- 8.3 Unauthorized water use shall be billed to the responsible party. Water use charges shall be based on meter readings, or estimates when meter readings are not available.
- 8.4 In case of unauthorized water use, the customer shall be billed for all applicable charges as if proper authorization for the water use had been obtained, including but not limited to bi-monthly service charges, installation charges and removal charges.

CITY OF SAN DIEGO CALIFORNIA DEPARTMENT INSTRUCTIONS	NUMBER DI 55.27	DEPARTMENT Water Department
SUBJECT FIRE HYDRANT METER PROGRAM (FORMERLY: CONSTRUCTION METER PROGRAM)	PAGE 10 OF 10	EFFECTIVE DATE October 15, 2002
	SUPERSEDES DI 55.27	DATED April 21, 2000

- 8.5 If damage occurs to Water Department property (i.e. fire hydrant meter, backflow, various appurtenances), the cost of repairs or replacements will be charged to the customer of record (applicant).

**Larry Gardner
Water Department Director**

- Tabs: 1. Fire Hydrant Meter Application
2. Construction & Maintenance Related Activities With No Return To Sewer
3. Notice of Discontinuation of Service

APPENDIX

Administering Division: Customer Support Division

Subject Index: Construction Meters
Fire Hydrant
Fire Hydrant Meter Program
Meters, Floating or Vehicle Mounted
Mobile Meter
Program, Fire Hydrant Meter

Distribution: DI Manual Holders



Application for Fire Hydrant Meter (EXHIBIT A)

(For Office Use Only)

NS REQ	FAC#
DATE	BY

METER SHOP (619) 527-7449

Meter Information

Application Date	Requested Install Date:
------------------	-------------------------

Fire Hydrant Location: (Attach Detailed Map//Thomas Bros. Map Location or Construction drawing.) Zip:	T.B.	G.B. (CITY USE)
Specific Use of Water:		
Any Return to Sewer or Storm Drain, if so, explain:		
Estimated Duration of Meter Use:	<input type="checkbox"/>	<input type="checkbox"/> Check Box if Reclaimed Water

Company Information

Company Name:			
Mailing Address:			
City:	State:	Zip:	Phone: ()
*Business license#		*Contractor license#	
A Copy of the Contractor's license OR Business License is required at the time of meter issuance.			
Name and Title of Billing Agent: <small>(PERSON IN ACCOUNTS PAYABLE)</small>			Phone: ()
Site Contact Name and Title:			Phone: ()
Responsible Party Name:			Title:
Cal ID#			Phone: ()
Signature:		Date:	
Guarantees Payment of all Charges Resulting from the use of this Meter. Insures that employees of this Organization understand the proper use of Fire Hydrant Meter			

Fire Hydrant Meter Removal Request	Requested Removal Date:
Provide Current Meter Location if Different from Above:	
Signature:	Title: Date:
Phone: ()	Pager: ()

<input type="checkbox"/> City Meter	<input type="checkbox"/> Private Meter
Contract Acct #:	Deposit Amount: \$ 936.00 Fees Amount: \$ 62.00
Meter Serial #	Meter Size: 05 Meter Make and Style: 6-7
Backflow #	Backflow Size: Backflow Make and Style:
Name:	Signature: Date:

WATER USES WITHOUT ANTICIPATED CHARGES FOR RETURN TO SEWER

Auto Detailing
Backfilling
Combination Cleaners (Vactors)
Compaction
Concrete Cutters
Construction Trailers
Cross Connection Testing
Dust Control
Flushing Water Mains
Hydro Blasting
Hydro Seeing
Irrigation (for establishing irrigation only; not continuing irrigation)
Mixing Concrete
Mobile Car Washing
Special Events
Street Sweeping
Water Tanks
Water Trucks
Window Washing

Note:

1. If there is any return to sewer or storm drain, then sewer and/or storm drain fees will be charges.

Date

Name of Responsible Party
Company Name and Address
Account Number: _____

Subject: Discontinuation of Fire Hydrant Meter Service

Dear Water Department Customer:

The authorization for use of Fire Hydrant Meter # _____, located at *(Meter Location Address)* ends in 60 days and will be removed on or after *(Date Authorization Expires)*. Extension requests for an additional 90 days must be submitted in writing for consideration 30 days prior to the discontinuation date. If you require an extension, please contact the Water Department, or mail your request for an extension to:

City of San Diego
Water Department
Attention: Meter Services
2797 Caminito Chollas
San Diego, CA 92105-5097

Should you have any questions regarding this matter, please call the Fire Hydrant Hotline at (619) _____ - _____.

Sincerely,

Water Department

APPENDIX C

MATERIALS TYPICALLY ACCEPTED BY CERTIFICATE OF COMPLIANCE

Materials Typically Accepted by Certificate of Compliance

1. Soil amendment
2. Fiber mulch
3. PVC or PE pipe up to 16 inch diameter
4. Stabilizing emulsion
5. Lime
6. Preformed elastomeric joint seal
7. Plain and fabric reinforced elastomeric bearing pads
8. Steel reinforced elastomeric bearing pads
9. Waterstops (Special Condition)
10. Epoxy coated bar reinforcement
11. Plain and reinforcing steel
12. Structural steel
13. Structural timber and lumber
14. Treated timber and lumber
15. Lumber and timber
16. Aluminum pipe and aluminum pipe arch
17. Corrugated steel pipe and corrugated steel pipe arch
18. Structural metal plate pipe arches and pipe arches
19. Perforated steel pipe
20. Aluminum underdrain pipe
21. Aluminum or steel entrance tapers, pipe downdrains, reducers, coupling bands and slip joints
22. Metal target plates
23. Paint (traffic striping)
24. Conductors
25. Painting of electrical equipment
26. Electrical components
27. Engineering fabric
28. Portland Cement
29. PCC admixtures
30. Minor concrete, asphalt
31. Asphalt (oil)
32. Liquid asphalt emulsion
33. Epoxy

APPENDIX D

SAMPLE CITY INVOICE

City of San Diego, Field Engineering Div., 9485 Aero Drive, SD CA 92123		Contractor's Name:	
Project Name:		Contractor's Address:	
Work Order No or Job Order No.			
City Purchase Order No.		Contractor's Phone #:	Invoice No.
Resident Engineer (RE):		Contractor's fax #:	Invoice Date:
RE Phone#:	Fax#:	Contact Name:	Billing Period: (to

Item #	Item Description	Contract Authorization				Previous Totals To Date		This Estimate		Totals to Date	
		Unit	Price	Qty	Extension	%/QTY	Amount	% / QTY	Amount	% / QTY	Amount
1					\$ -		\$ -		\$ -	0.00%	\$ -
2					\$ -		\$ -		\$ -	0.00%	\$ -
3					\$ -		\$ -		\$ -	0.00%	\$ -
4					\$ -		\$ -		\$ -	0.00%	\$ -
5					\$ -		\$ -		\$ -	0.00%	\$ -
6					\$ -		\$ -		\$ -	0.00%	\$ -
7					\$ -		\$ -		\$ -	0.00%	\$ -
8					\$ -		\$ -		\$ -	0.00%	\$ -
9					\$ -		\$ -		\$ -	0.00%	\$ -
10					\$ -		\$ -		\$ -	0.00%	\$ -
11					\$ -		\$ -		\$ -	0.00%	\$ -
12					\$ -		\$ -		\$ -	0.00%	\$ -
13					\$ -		\$ -		\$ -	0.00%	\$ -
14					\$ -		\$ -		\$ -	0.00%	\$ -
15					\$ -		\$ -		\$ -	0.00%	\$ -
16					\$ -		\$ -		\$ -	0.00%	\$ -
17	Field Orders				\$ -		\$ -		\$ -	0.00%	\$ -
18	CHANGE ORDER No.				\$ -		\$ -		\$ -	0.00%	\$ -
Total Authorized Amount (including approved Change Order)					\$ -		\$ -		\$ -	Total Billed	\$ -

SUMMARY

A. Original Contract Amount	\$ -
B. Approved Change Order #00 Thru #00	\$ -
C. Total Authorized Amount (A+B)	\$ -
D. Total Billed to Date	\$ -
E. Less Total Retention (5% of D)	\$ -
F. Less Total Previous Payments	\$ -
G. Payment Due Less Retention	\$0.00
H. Remaining Authorized Amount	\$0.00

**I certify that the materials
have been received by me in
the quality and quantity specified**

Resident Engineer

Construction Engineer

Retention and/or Escrow Payment Schedule

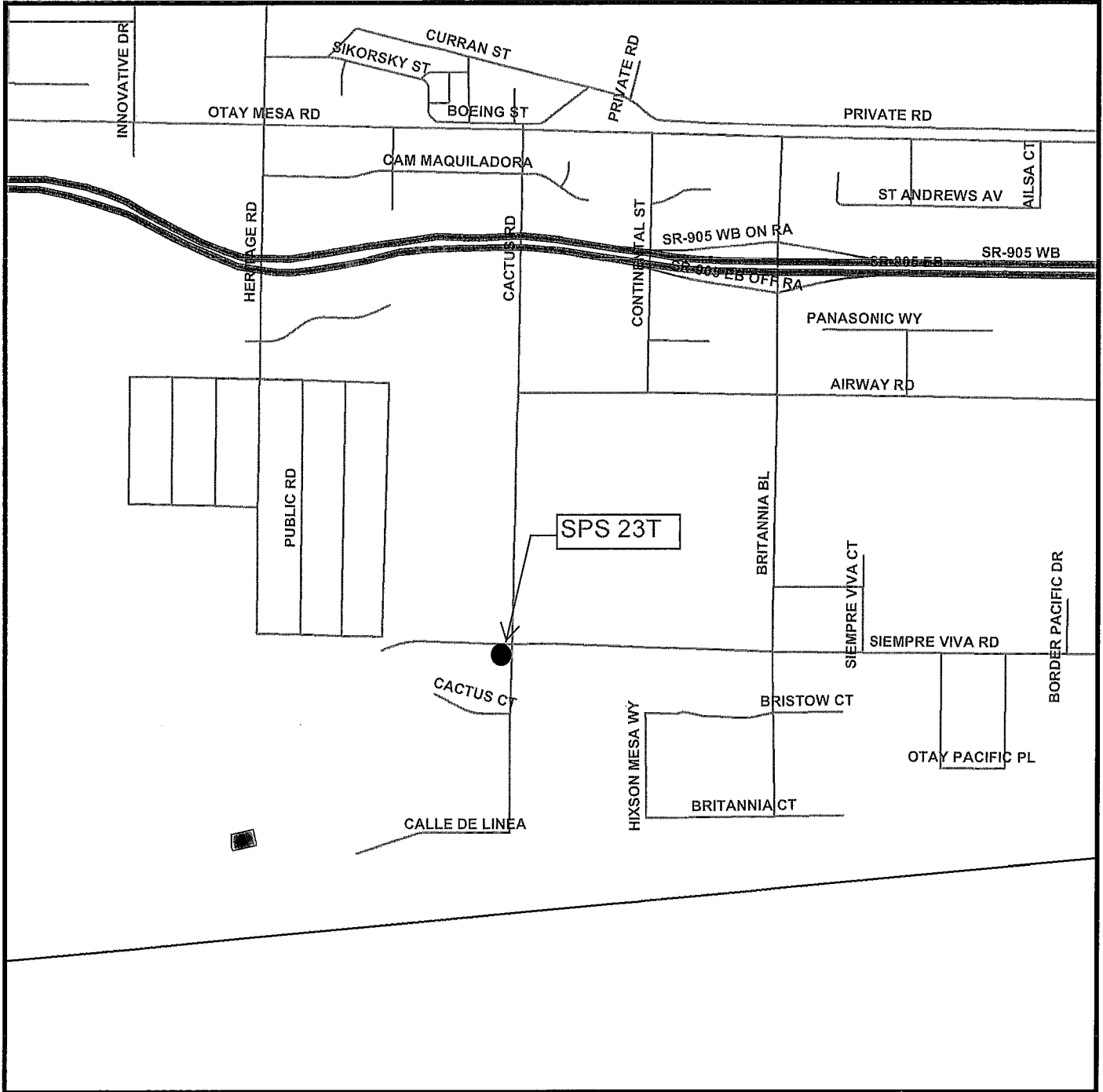
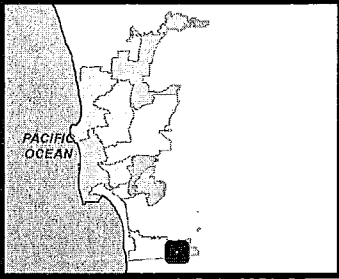
Total Retention Required as of this billing (Item E)	\$0.00
Previous Retention Withheld in PO or in Escrow	\$0.00
Add'l Amt to Withhold in PO/Transfer in Escrow:	\$0.00
Amt to Release to Contractor from PO/Escrow:	

Contractor Signature and Date: _____

APPENDIX E
LOCATION MAP

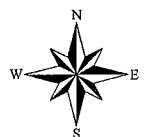
Pump Station 23T Reliability Improvements

SENIOR ENGINEER Alex Garcia (619) 533-3634	PROJECT MANAGER Ivan Hoffman (619) 533-5196	PROJECT ENGINEER Luis Chavez (619) 533-4188	FOR QUESTIONS ABOUT THIS PROJECT Call: (619) 533-4207 Email: engineering@sandiego.gov
--	---	---	---



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Legend ● Sewer Pump Station



APPENDIX F

ADVANCED METERING INFRASTRUCTURE (AMI) DEVICE PROTECTION

Protecting AMI Devices in Meter Boxes and on Street Lights

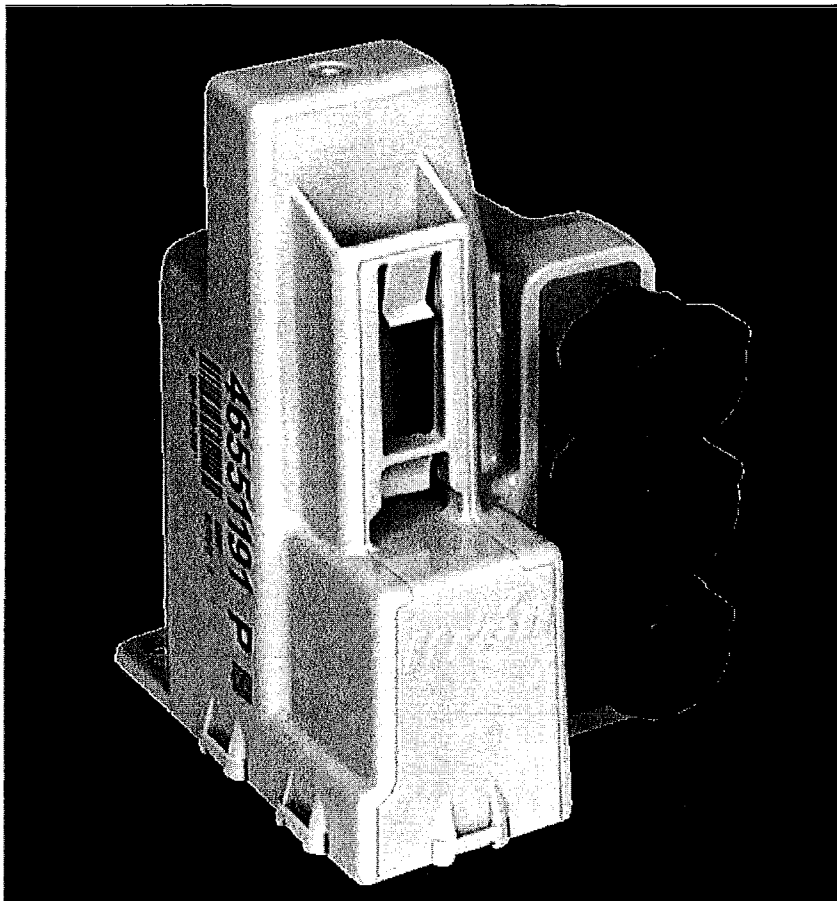
The Public Utilities Department (PUD) has begun the installation of the Advanced Metering Infrastructure (AMI) technology as a new tool to enhance water meter reading accuracy and efficiency, customer service and billing, and to be used by individual accounts to better manage the efficient use of water. **All AMI devices shall be protected per Section 5-2, "Protection", of the 2015 Whitebook.**

AMI technology allows water meters to be read electronically rather than through direct visual inspection by PUD field staff. This will assist PUD staff and customers in managing unusual consumption patterns which could indicate leaks or meter tampering on a customer's property.

Three of the main components of an AMI system are the:

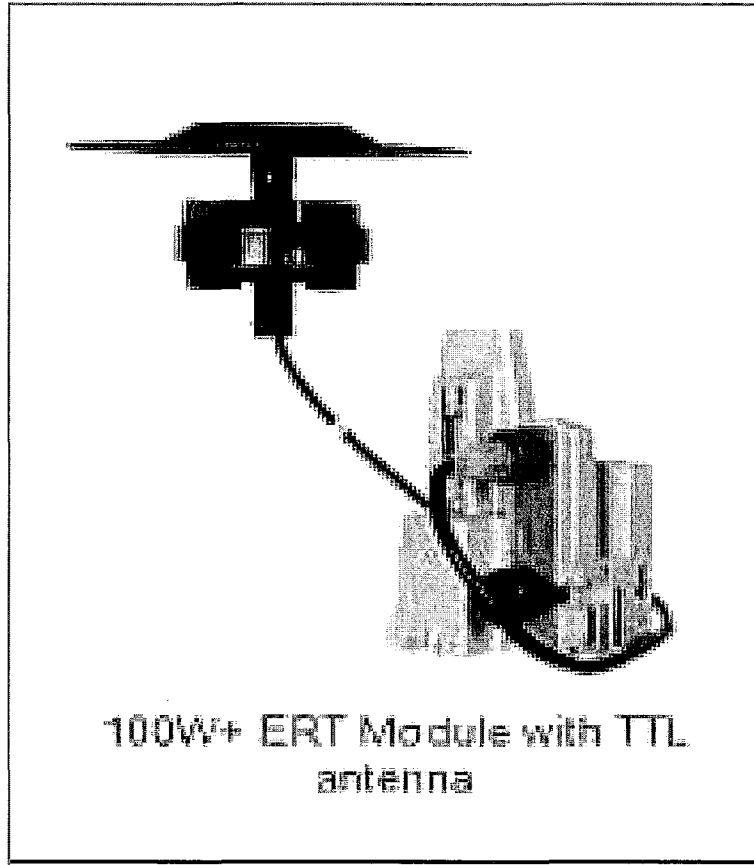
- A. Endpoints, see Photo 1:

Photo 1



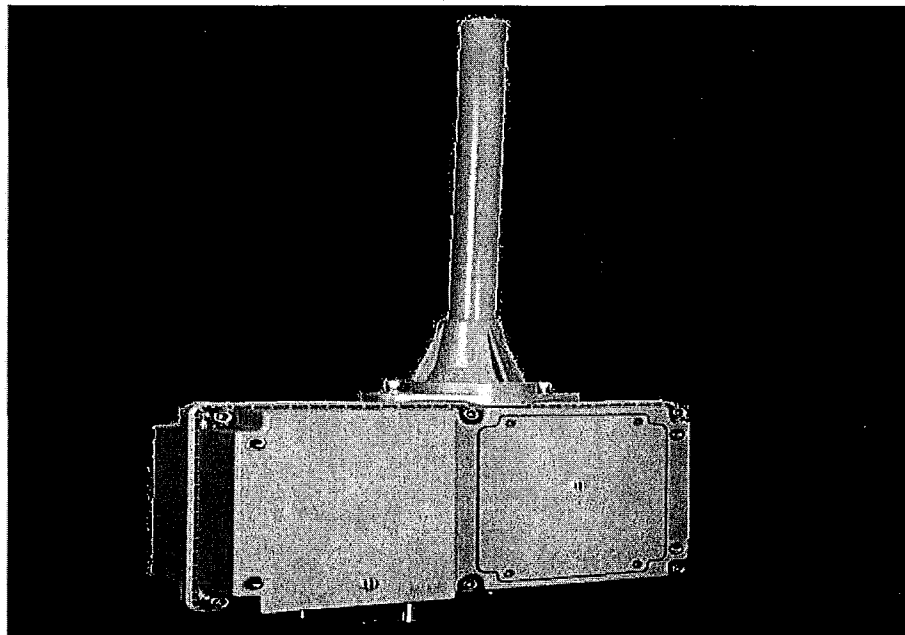
B. AMI Antenna attached to Endpoint (antenna not always required), see Photo 2:

Photo 2



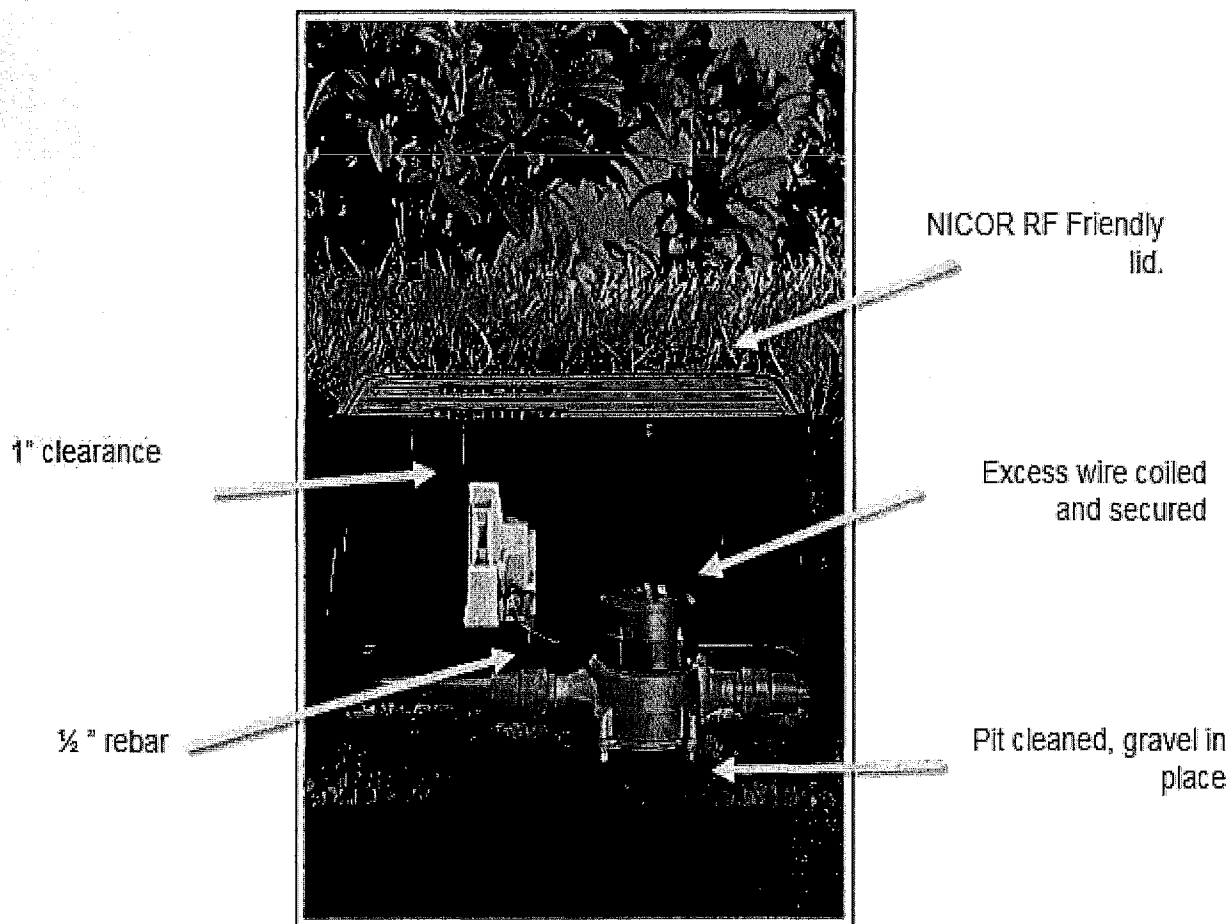
Network Devices, see Photo 3:

Photo 3



AMI endpoints transmit meter information to the AMI system and will soon be on the vast majority of meters in San Diego. These AMI devices provide interval consumption data to the PUD's Customer Support Division. If these devices are damaged or communication is interrupted, this Division will be alerted of the situation. The endpoints are installed in water meter boxes, coffins, and vaults adjacent to the meter. A separate flat round antenna may also be installed through the meter box lid. This antenna is connected to the endpoint via cable. The following proper installation shall be implemented when removing the lid to avoid damaging the antenna, cable, and/or endpoint. Photo 4 below demonstrates a diagram of the connection:

Photo 4



The AMI device ERT/Endpoint/Transmitter shall be positioned and installed as discussed in this Appendix. If the ERT/Endpoint/Transmitter is disturbed, it shall be re-installed and returned to its original installation with the end points pointed upwards as shown below in Photo 5.

The PUD's code compliance staff will issue citations and invoices to you for any damaged AMI devices that are not re-installed as discussed in the Contract Document

Photo 5 below shows a typical installation of an AMI endpoint on a water meter.

Photo 5

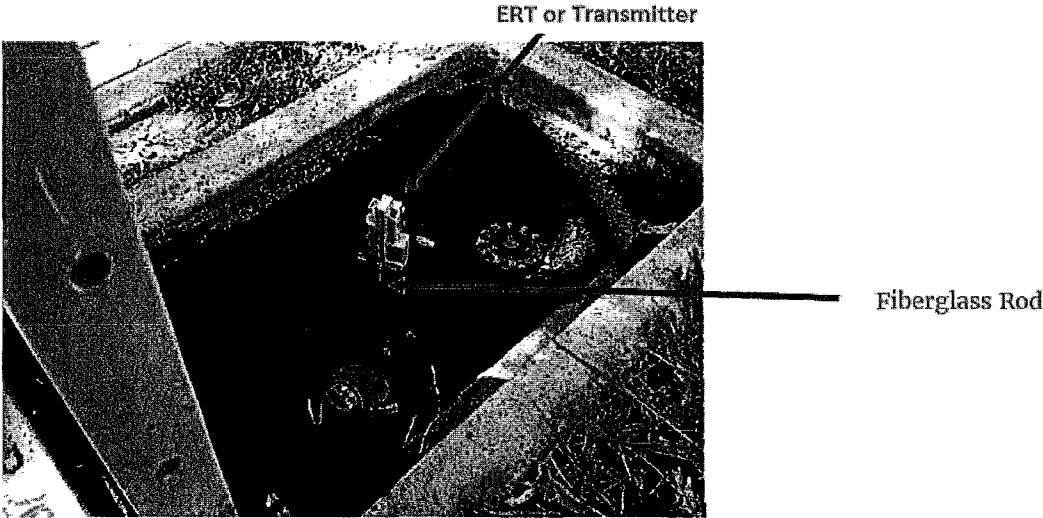
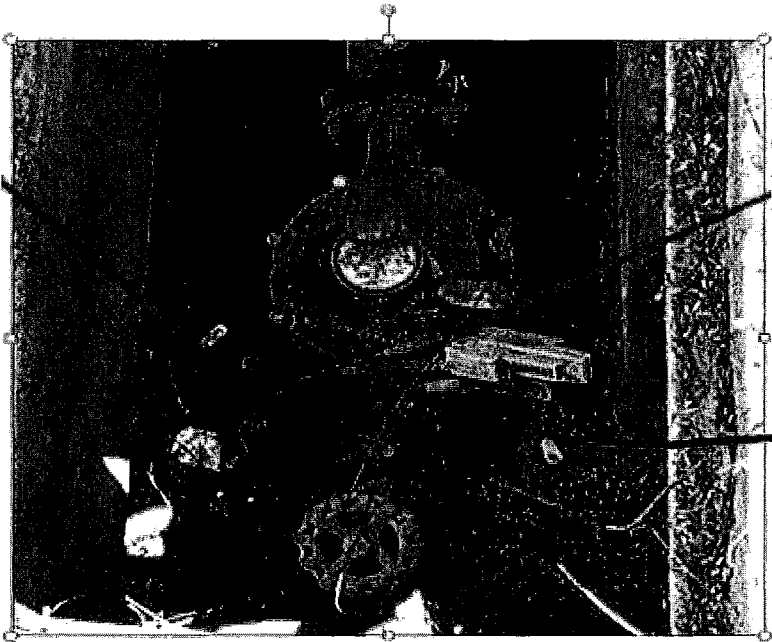


Photo 6 below is an example of disturbance that shall be avoided:

Photo 6

The antenna was drilled into the lid and now it is removed



The ERT has been disconnected from the Water Meter

The endpoint is taken off the rod which is the original installation location

You are responsible when working in and around meter boxes. If you encounter these endpoints, use proper care and do not disconnect them from the registers on top of the water meter. If the lid has an antenna drilled through, do not change or tamper with the lid and inform the Resident Engineer immediately about the location of that lid. Refer to Photo 7 below:

Photo 7



Another component of the AMI system are the Network Devices. The Network Devices are strategically placed units (mainly on street light poles) that collect interval meter reading data from multiple meters for transmission to the Department Control Computer. **If you come across any of these devices on street lights that will be removed or replaced (refer to Photos 8 and 9 below), notify AMI Project Manager Arwa Sayed at (619) 362-0121 immediately.**

Photo 8 shows an installed network device on a street light. On the back of each Network Device is a sticker with contact information. See Photo 9. **Call PUD Water Emergency Repairs at 619-515-3525 if your work will impact these street lights.** These are assets that belong to the City of San Diego and you shall be responsible for any costs of disruption of this network.

Photo 8



Network Device

Photo 9



If you encounter any bad installations, disconnected/broken/buried endpoints, or inadvertently damage any AMI devices or cables, notify the Resident Engineer immediately. The Resident Engineer will then immediately contact the AMI Project Manager, Arwa Sayed, at (619) 362-0121.

APPENDIX G
LEAD RELATED CONSTRUCTION SPECIFICATION



THE CITY OF SAN DIEGO



LEAD RELATED CONSTRUCTION SPECIFICATION

for

Sewer Pump Station 23T Reliability Improvements (Facility 900002) January 20, 2016

Prepared by:

Wm. Brad Blondet
Asbestos & Lead Program Inspector
CDPH Inspector/Assessor #5464

Reviewed by:

Mike Anderson
Asbestos & Lead Program Inspector
CDPH Inspector/Assessor #17780

City of San Diego
Environmental Services Department
Office of Energy, Sustainability and Environmental Protection
Asbestos & Lead Management Program
9601 Ridgehaven Court, Ste 320
San Diego, CA 92123
Tel: (858) 492-5086
Fax: (858) 492-5089

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DIVISION 01 - GENERAL REQUIREMENTS

1.1 SUMMARY SCOPE OF WORK

- 1.1.1 Remove and replace intact piping and support brackets to accommodate the improvements to Sewer Pump Station 23T using lead safe work practices and lead abatement principles.
- 1.1.2 Stabilize any loose and flaking paint which may be impacted as a result of the component removal.
- 1.1.3 Lead related activities shall be completed in a demarcated work area and access restricted to certified personnel only.
- 1.1.4 When doing exterior work, extend the drop sheeting (6 mil polyethylene sheeting) as close to the building as possible. Sheeting shall be a minimum of 15 feet from the building. Erect vertical shroud if there is visible movement of debris beyond the ground sheeting.
- 1.1.5 When doing interior work, plastic drop sheeting should be in place on the floor within 15 feet of any area where lead paint is being disturbed.
- 1.1.6 All waste collected must be stored in sealable drum containers (not in bags).
- 1.1.7 Laboratory results and investigation reports (see Appendix C).

1.2 CONTRACTOR USE OF THE PREMISES

All site rules and regulations affecting the work should be complied with while engaged in project activities. The existing building should be maintained in a safe condition throughout the lead related construction activities. The Contractor will be responsible for adhering to all applicable building codes and fire safety requirements.

All public areas will be kept free of accumulated waste, materials, rubbish, and debris.

1.3 PROJECT COORDINATION

It will be the responsibility of the Contractor to coordinate all site activities with the City's Asbestos & Lead Management Program's Project Monitor including any meetings, surveys, special reports, and site usage limitations.

1.4 PROJECT SUBMITTALS

The contractor shall not commence any work until approval has been given from the City. The Contractor shall submit the following at least 60 days prior to commencement of any lead related construction activities:

1. Method, equipment, and materials for lead related construction activities
2. Site plan indicating areas of work and lead decontamination facilities, if necessary
3. A description of methods to be used to control dispersion of dust to the interior and exterior of the building
4. Methods used to assure the safety of workers and visitors to the site
5. Respiratory protection program
6. Copies of Blood Lead Levels and Zinc Protoporphyrin tests for lead Supervisor and abatement workers
7. A list of employees who will be performing the work and the supervisor in charge of the project
8. Employee proof of lead training and Certificates of Worker's Acknowledgment not previously submitted
9. Copies of Contractor's EPA's Renovate, Repair, Painting (RRP) training certificates and Certificate of Worker's Acknowledgment (Appendix A) for all employees who will be doing work
10. Prior to any abatement activities the contractor must submit a CDPH Form 8551 (Abatement of Lead Hazards Notification) to the Compliance and Enforcement Unit of the CLPPB. The Form 8551 must be posted at the entrances to the property at least 5 days prior and during abatement activities.*
11. Submit Cal/OSHA pre-job notification for lead-related construction work per Title 8 CCR 1532.1 subsection (p), "Lead-Work Pre-Job Notification".
12. Permits, notifications, and licenses needed to perform work (including hazardous waste hauler's registration)
13. The timing and projected completion date of the work.
14. Site specific contingency plan (for emergencies including fire, accident, power failure, or any other event that may require notification, decontamination, or work area isolation procedures)
15. Estimation of the type and amount of waste to be generated
16. Any special reports

*The Contractor will be required to submit training certificates for any “new” employees in the project-specific package.

At the end of a project, the Contractor shall submit the following to the Project Monitor:

1. Personal Air Sample Results
2. Copies of Project Daily Logs
3. Containment Entry/Exit Logs
4. Waste Disposal Documentation
5. Certificate of Visual Inspection

1.5 SCHEDULES AND REPORTS

Prior to each phase of project, the Contractor shall provide the City with a tentative time line which outlines the project schedule. These documents will be reviewed and approved by the City prior to the commencement of work.

1.6 PRODUCT DATA

The Contractor shall submit product information that is to be used during the lead hazard control activities prior to commencement of work (i.e., encapsulants). General information required on product data includes manufacturer’s standard printed recommendations for application and use, compliance with recognized standards of trade association and testing agencies, and material safety data sheets (MSDSs).

1.7 PROJECT CLOSE-OUT

Upon completion of work and prior to payment, the Project Monitor will proceed with an initial inspection of the lead hazard control area. A Certificate of Visual Inspection (Appendix B) will be signed by both the Contractor and Project Monitor. The Contractor will not be paid until the area meets the established project-specific clearance criteria and has submitted the required information.

DIVISION 02 - DEFINITIONS

2.1 DEFINITIONS

- 2.1.1 **Abatement:** Any set of measures designed to permanently eliminate lead based paint hazards including paint removal, building component removal, or near-permanent enclosure of lead based paint hazards.
- 2.1.2 **Accredited or Accreditation:** (when referring to a person or laboratory): A person or laboratory having the appropriate accreditation as described in the specific section of this specification.

- 2.1.3 Action Level: An 8-hour time weighted average (TWA) lead airborne concentration of 30 $\mu\text{g}/\text{m}^3$.
- 2.1.4 Air Monitoring: The process of measuring the airborne concentrations of a contaminant.
- 2.1.5 Authorized Visitor: The Owner, the Owner's Representative, testing lab personnel, the Architect/Engineer, emergency personnel or a representative of a Federal, State and local regulatory or other agency having authority over the project.
- 2.1.6 Containment: A process for protecting both workers and environment by controlling exposures to lead dust and debris created during abatement.
- 2.1.7 Contaminate: Refers to lead-containing dust/debris.
- 2.1.8 Contractor: Refers to the Lead Hazard Control contractor.
- 2.1.9 Demolition: The wrecking or taking out of any building component, system, finish or assembly of a facility together with any related handling operations.
- 2.1.10 Deteriorated Lead-Based Paint: Any interior or exterior lead based paint that is peeling, chipping, blistering, flaking, worn, chalking, "alligatoring" or cracking, or otherwise separating from the substrate, or located on any surface or fixture that is damaged or deteriorated.
- 2.1.11 Encapsulation: Any covering or coating that acts as a barrier between lead based paint and the environment and that relies on adhesion and the integrity of the existing paint bonds between layers and with the substrate for its durability.
- 2.1.12 Enclosure: The use of rigid durable construction materials that are mechanically fastened to the substrate in order to act as a barrier between lead based paint and the living or work space.
- 2.1.13 Exterior Window Sill: The portion of the horizontal window sill that receives the window sash when closed, often located between the storm window and the interior window sash (sometimes called the window well). If there is no storm window, the exterior window sill consists of the portion of horizontal window trim immediately outside the window sash when closed.
- 2.1.14 Friction Surface: Any interior or exterior surface subject to abrasion or friction, such as windows or stair treads.
- 2.1.15 HEPA Filter: A high Efficiency Particulate Air (HEPA) filter capable of trapping and retaining 99.97% of all mono-dispersed particles greater than 0.3 microns in diameter or larger.

- 2.1.16 HEPA Filter Vacuum Collection Equipment (or vacuum cleaner): High efficiency particulate air filtered vacuum collection equipment with a filter system capable of collecting and retaining lead.
- 2.1.17 High Phosphate Detergent: Detergent which contains at least 5% tri sodium phosphate.
- 2.1.18 Impact surface: Any interior or exterior surface subject to damage by repeated impacts, such as surfaces on doors and door jambs.
- 2.1.19 Interim Controls: A set of measures designed to reduce temporarily human exposure or likely exposure to lead based paint hazards, including dust removal, paint stabilization, treatment of friction/abrasion points, and treatment of bare soil.
- 2.1.20 Interior Window Sill: The portion of the horizontal window ledge that protrudes into the interior of the room, adjacent to the window sash when closed; often called the window stool.
- 2.1.21 Lead: Means metallic lead, all inorganic lead compounds, and organic lead soaps.
-
- 2.1.22 Lead-Based Paint (LBP): For purposes of this project, LBP refers to the materials identified in these specifications as having paint that contains lead.
- 2.1.23 Lead-Related Construction Project Monitor: Means an individual who oversees lead-related construction work to ensure that contract plans and specifications are followed. This person must have received certification as a lead-related construction Project Monitor.
- 2.1.24 Lead-Related Construction Supervisor: Means an individual who is responsible for implementing lead-related construction work and enforcing work practices. This person must have received certification as a lead-related construction Supervisor.
- 2.1.25 Lead-Related Construction Work: Means any construction, alteration, painting, demolition, salvage, renovation, repair, or maintenance of a building, including preparation and cleanup, by disturbing lead-containing material that may result in exposure of individuals to lead.
- 2.1.26 Lead-Related Construction Worker: Means any individual who performs lead-related construction work in a building under the direction of lead-related construction Supervisor, and has received certification as a lead-related construction Worker.
- 2.1.27 Owner: Refers to the City of San Diego
- 2.1.28 Paint film stabilization: The process of using wet scraping, priming, and repainting a deteriorated lead based paint film in a dwelling including clean-up and clearance.

- 2.1.29 Paint removal: A strategy of abatement which entails removing lead based paint from surfaces of components using chemicals, heat guns below 11000F, and certain contained abrasive methods but not open flame burning, open abrasive blasting, sandblasting, water blasting, extensive dry scraping, or methylene chloride removers.
- 2.1.30 Permissible Exposure Limit (PEL): An 8-hour TWA lead airborne concentration of 50 µg/m³.
- 2.1.31 Personal Monitoring: Sampling of contaminant concentrations within the breathing zone of an employee.
- 2.1.32 Project Monitor: City of San Diego Asbestos & Lead Management Program staff or their designated consultant
- 2.1.33 Protection Factor: The ratio of the ambient concentration of an airborne substance to the concentration of the substance inside the respirator at the breathing zone of the wearer. The protection factor is a measure of the degree of protection provided by a respirator to the wearer.
- 2.1.34 RRP: EPA's Renovation, Repair and Painting certification that requires contractor training and lead-safe work practices when performing renovation type activities in housing built prior to 1978.
- 2.1.35 Replacement: A strategy of abatement which entails the removal of components such as windows, doors, and trim that have lead painted surfaces and installing new components free of lead paint.
- 2.1.36 Respirator: A device designed to protect the wearer from the inhalation of harmful contaminants.
- 2.1.37 Testing Laboratories: A "testing laboratory" is an entity engaged to perform specific inspections or tests, either at the project site (or elsewhere), and to report on, and, if required, to interpret results of, those inspections or tests.
- 2.1.38 Time-Weighted Average (TWA): The average concentration of a contaminant in air during a specific time period.
- 2.1.39 Trigger Tasks: Work tasks that require an employer to assume specified employee exposures until the employer has performed an exposure assessment [see T8CCr, 1532.1 (d) (2)].
- 2.1.40 Wet Cleaning: The process of eliminating lead contamination from building surfaces and objects by using cloths, mops, or other cleaning utensils which have been dampened with amended water or diluted removal encapsulant and afterwards thoroughly decontaminated or disposed of appropriately

2.1.41 Work Area: The area where abatement work operations are performed which is defined and/or isolated to prevent the spread of contamination, and entry by unauthorized personnel.

DIVISION 03 - SITE WORK

3.1 INTRODUCTION

This portion of the specification describes procedures and protocols for lead hazard control activities. The protocols/procedures described hereafter are in accordance with federal/state/local requirements. In the absence of these requirements, the procedure/protocols are based on current industry standards.

3.2 BACKGROUND INFORMATION

Sampling has been performed by inspectors from the City's Asbestos and Lead Management Program (ALMP) and has been provided in Appendix C of this specification. Waste characterization costs are the responsibility of the contractor.

3.3 GENERAL INFORMATION

3.3.1 Potential Lead Hazard

The disturbance of LBP may cause exposure to workers and building occupants. All ~~workers, supervisory personnel, subcontractors, and consultants who will be at the job site,~~ need to be apprised of the seriousness of the hazard and of proper work practices which must be followed to minimize exposure to lead-containing dust. The procedures and methods described herein must be followed and the Contractor must comply with all applicable federal/state/local requirements.

3.3.2 Stop Work

If the Project Monitor presents a verbal or written stop work order, the Contractor shall immediately and automatically stop all work. Recommencement of the work may not begin until authorized by the Project Monitor.

3.4 PROJECT ADMINISTRATION

3.5 CERTIFIED SUPERVISOR

The Contractor needs to provide a full-time EPA RRP certified supervisor who is experienced in administration and supervision of lead renovation projects including work practices, protective measures for building and personnel, disposal procedures, etc. This supervisor must have completed the 8 hour EPA RRP course and have a copy of his/her certification from an accredited training provider. This person will act as the competent person on the job.

In addition, all employees working with lead paint on the project must have received onsite training by the RRP certified person and obtain a proof of training onsite.

3.6 SPECIAL REPORTS

3.6.1 Reporting Unusual Events

When an event of unusual and significant nature occurs at the site (e.g., a spill of lead debris,

failure of special equipment used to contain lead), the Contractor shall prepare and submit a special report listing the chain of events, persons participating, response by Contractor's personnel, evaluation of results, and other pertinent information.

3.6.2 Reporting Accidents

The Contractor shall prepare and submit reports of significant accidents at the subject site. Pertinent data and actions need to be recorded. In addition, response actions should comply with industry standards. For this purpose, a significant accident is defined to include events where personal injury or property loss of substance is sustained, or where the event posed a significant threat of loss or personal injury or potential environmental contamination.

3.7 COMPLIANCE WITH CODES AND REGULATIONS

Except to the extent that more explicit, or more stringent requirements are written directly into this Lead Hazard Control Contract/Specification, all applicable codes, regulations, and standards have the same force and effect (and are made a part of the contract documents by reference) as if copied directly into the contract documents, or as if published copies are bound herewith.

~~The Contractor will assume full responsibility and liability for the compliance with all applicable federal/state/local regulations pertaining to work practices, protection of workers, and visitors to the site, persons occupying areas adjacent to the site, hauling, and disposal of waste. The Contractor shall hold the City and its representative harmless for the Contractor's failure to comply with any applicable work, hauling, disposal, safety, health, or other regulation on the part of itself, its employees, or its subcontractors. State requirements which govern lead hazard control activities or hauling and disposal of hazardous waste include, but are not limited to, the following:~~

California Occupational Safety and Health Administration (Cal/OSHA):

- Division of Industrial Safety; Chapter 4
- T8CCR, Section 1532.1, Lead in Construction
- T8CCR, Section 5194, Hazard Communication Standard
- T8CCR, Section 1531, Construction Respiratory Protection Standard
- T8CCR, Section 1514, Construction Personal Protective Equipment
- T8CCR, Section 1509, Construction Injury Illness Prevention Program
- T8CCR, Section 6003-4, Accident Prevention Signs and Tags
- T8CCR, Section 3204, Access to Employee Exposure Medical Records

California Environmental Protection Agency (Cal/EPA):

- T22CCR, Division 4.5, Environmental Health Standards for the Management of Hazardous Waste.

California Department of Health Services (DHS):

- T17CCR, Division 1, Chapter 8, Accreditation of training providers and interim

certification of individuals engaged in lead-related construction work.

Federal requirements which govern lead hazard control activities or hauling and disposal of hazardous waste include, but are not limited to, the following:

Federal Environmental Protection Agency (FED/EPA):

- Hazardous Waste Standards, 40 Code of Federal Regulations (CFR), Part 261
- EPA Renovate, Repair, Painting (RRP) Training

U.S. Department of Transportation (DOT):

- Hazardous Substances, 49CFR, Parts 171 through 180

American National Standards Institute, Inc. (ANSI):

- Z9.2-79 Fundamentals Governing the Design and Operation of Local Exhaust
- Z88.2-80 Practices of Respiratory Protection

Department of Housing and Urban Development (HUD):

- Guidelines for the Evaluation and Control of Lead Based Paint Hazards in Housing (most current draft or final copy)

In addition, the Contractor must comply with any applicable regulations promulgated as a result of Title X, the Residential Lead Based Paint Hazard Reduction Act and Title IV, Lead Exposure Reduction Act.

Local requirements which govern lead hazard control activities include, but are not limited to, the following:

Air Pollution Control District (APCD) - San Diego County

- APCD Rules and Regulations, Rule 51 (Public Nuisance), Rule 10-11 (permitting of equipment)

San Diego Municipal Code §54.1001 etc. seq.

- Prevents, identifies and remedies lead hazards within the City of San Diego

3.8 PERMITS AND LICENSES

The Contractor shall submit to the City in the bid submittal any permits or licenses necessary to carry out this work.

3.9 PERMITS

A valid Hazardous Waste Hauler registration is required for transporting any hazardous waste.

Certain types of equipment require APCD permits (e.g., abrasive blasters).

3.10 LICENSES

The Contractor must be certified by the California Contractors State License Board. The Contractor, or its subcontractor, shall have current licenses, as required by all applicable state or local jurisdictions for the removal, transportation, disposal, or other regulated activity relative to the work described in this plan.

3.11 HEALTH AND SAFETY

3.12 GENERAL WORKER PROTECTION/HEALTHY & SAFETY

This section describes the equipment and procedures required for protecting workers from lead contamination and other workplace hazards.

3.12.1 Worker Training

Contractor workers shall at a minimum have field training by an RRP certified person in lead safe work practices

3.12.2 Medical Surveillance

Workers must be provided with initial biological monitoring (blood sampling) if they are occupationally exposed on any day to lead at or above the action level (AL). Employees must be provided with biological monitoring and a medical examination if they are occupationally exposed to lead above the action level for more than 30 days in any consecutive 12 month period. Periodic biological monitoring and medical examinations must be performed according to the schedule and criteria specified in T8CCR, Section 1532.1(j). In addition, employees performing “trigger” tasks must be included in biological monitoring and/or medical examinations based on their assumed exposure. In the absence of specific airborne exposure data, medical surveillance will need to be provided for all workers.

At a minimum, examinations shall meet all requirements as set forth in T8CCR, Section 1532.1. Furthermore, if an employee’s blood levels are at or above 20µg/dl they will not be allowed to work on the project and shall be medically removed until two consecutive blood lead tests show the employee’s blood lead level under 15µg/dl.

In addition, evaluations of each individual’s ability to work in environments capable of producing heat stress in the worker should be completed. Employees who wear respirators must be medically evaluated.

3.12.3 Personal Protective Equipment (PPE)

Workers must be provided and are required to wear the following personal protective equipment at all times when performing lead related construction work.

PPE should include:

- Disposable Clothing (With hood and boot coverings)
- Boots
- Hard Hats
- Eye Protection
- Gloves

3.12.4 Additional Protective Equipment

The Contractor is responsible for all other equipment; such as eye wash stations, plastic aprons, etc., as needed.

3.12.5 Decontamination Procedures

Decontamination procedures will be determined on a case-by-case basis. At minimum, Contractor shall have hand washing facilities available.

3.12.6 Activities within Work Area

Workers may NOT eat, drink, smoke, chew gum or tobacco in the work area. Before eating, chewing, drinking, or smoking, workers will need to follow the decontamination procedures specified, and then dress in street clothes before entering the non-work areas of the building.

3.12.7 Certificate of Worker's Acknowledgment

Each worker is required to complete a certificate stating that he/she has been trained in respiratory protection and lead hazards, and is in a medical surveillance program (see Appendix A).

3.12.8 Worker Respiratory Protection

The Contractor must provide for the instruction and training of each worker in the proper use of respiratory protection. The Contractor shall require that each worker wear a properly fitted respirator during activities for which it is reasonable to expect exposures above the PEL and during the performance of trigger tasks until exposure have been measured and found to be less than the PEL. Respiratory protection, appropriate for the task encountered in the work place, or as required for other toxic or oxygen-deficient situations encountered, needs to be utilized. The Contractor is responsible for having a written respiratory protection program, proper selection of respirations, training, and initial and periodic (every six [6] months) fit testing of their employees.

3.12.9 Respiratory Protection Standards

Except to the extent that more stringent requirements are written directly into these Lead Related Construction Specifications, the following regulations and standards have the same force and effect (and are made a part of the contract documents by reference) as if copied directly into the contract documents, or as if published copies were bound herewith. Where there is a conflict in requirements set forth in these regulations and standards, the Contractor

shall meet the more stringent requirement.

Cal/OSHA : T8CCR, Sections 1531, 1532.1 and 5216

ANSI: Practices for Respiratory Protection, ANSI Z88.2-1980

National Institute for Occupational Safety and Health (NIOSH)

3.13 LEAD HAZARD CONTROL ACTIVITIES/PROTOCOLS

General guidelines for performing lead hazard control activities are presented in this section and are based on procedures established by HUD for residential settings. Due to the difference between residential settings and commercial buildings, these procedures will be modified on a case-by-case basis.

3.14 WORKSITE PREPARATION

Building occupants and visitors will not be allowed to enter the specific area where lead hazard control activities are underway. Re-entry is only permitted after the area is deemed to be cleared for re-occupancy by a state certified Lead Project Monitor.

The work area shall be restricted to authorized personnel only. A list of authorized personnel shall be established prior to the start of work. Entry of unauthorized personnel into the work area shall be reported immediately to the Certified Supervisor, and the Project Monitor.

Warning signs for lead shall be posted as per T8CCR, Section 1532.1(m).

A visitor entry and exit-log, and an employee daily sign-in log will be maintained throughout the lead hazard control activities. The Contractor shall be responsible for the project site security during the operations in order to protect work efforts and equipment.

3.15 TEMPORARY FACILITIES

Temporary facilities for lead hazard control activities may comply with these specifications.

3.15.1 Materials and Equipment

Only material and equipment that are recognized as being suitable for the intended use, by compliance with appropriate standards, may be used.

3.15.2 Water Service

The Contractor will be able to obtain water services from on-site facilities. The City will designate the facilities from which water service may be obtained.

3.15.3 Electrical Services

The Contractor will be able to obtain electrical services from on-site facilities. The City will designate the facilities from which electrical services may be obtained. The contractor shall

provide their own electrical hook-ups, i.e. spider boxes, ground fault circuit interrupter (GFCI) etc. and installed by a licensed electrician.

The electrical services need to comply with the applicable NEMA, NECA, and UL standards, and governing regulations for materials and lay-out of temporary electrical services.

3.15.4 Sanitary Facilities

The Contractor will be able to use the sanitary facilities on-site. The City will designate the sanitary facilities that the Contractor may use.

3.15.5 Fire Extinguisher

Applicable recommendations of the National Fire Protection Association (NFPA) Standard 10, "Standard for Portable Fire Extinguishers," must be complied with by the Contractor. Fire extinguishers need to be located where they are most convenient and effective for their intended purpose, but not less than one (1) extinguisher in each work area, the equipment room, outside/work areas, and in the clean room.

3.15.6 First Aid

~~The Contractor will need to provide first aid supplies which should comply with the governing regulations and recognized recommendations within the construction industry.~~

3.16 METHODS OF CONTROL

Below are methods for controlling lead based paint that may take place during the Lead Related Construction Activities. Temporary methods are designed to last less than 20 years while permanent methods are designed to last greater than 20 years.

3.16.1 Less than 20 years:

Paint Film Stabilization:

The primary methods are wet scraping or wet sanding. It is preferable to use a HEPA vacuum attachment for scraping and sanding. Dry scraping and sanding are not allowed in specific situations.

Encapsulation:

Use an appropriate primer to ensure adhesion of paint to the substrate prior to demolition.

3.16.2 More than 20 years:

If building components with lead paint are being removed, the following shall be followed:

Building Component Replacement:

The removal of doors, windows, trim, and other building items that contain lead paint. This will involve misting the component with water, scoring the painted seams, removal of any fasteners, prying the building component away from the surface to which it is attached, removal and bending back of all nails, removal of component, and immediate HEPA vacuum

any dust chips on the area where the components were located.

3.16.3 Prohibited Practices

Prohibited abatement methods include:

1. Open flame burning or torching, propane fueled heat grids.
2. Machine sanding or grinding without HEPA local vacuum exhaust tool.
3. Uncontained hydro-blasting or pressure washing.
4. Abrasive blasting or sandblasting without HEPA local vacuum exhaust tool.
5. Heat guns operating above 1100⁰F.
6. Methylene chloride paint removal products.
7. Dry Scraping (except for limited surface areas).

3.17 CLEANING

Daily cleaning includes removing large and small debris, HEPA vacuuming horizontal surfaces, wet mopping, and then HEPA vacuuming horizontal surfaces, and possible exterior cleaning.

Final cleaning must occur no sooner than one (1) hour after lead hazard control activities are finished. All plastic should be misted, cleaned, and folded toward the center to trap any remaining dust. The order of removal should be upper plastic, the first layer of floor plastic, vent and door plastic, the second layer of floor plastic, and finally plastic separating contaminated from non-contaminated areas. Then the entire area should be cleaned using a HEPA vacuum/wet wash/HEPA vacuum cycle. This should be from ceiling to floor. Paint or otherwise seal treated surfaces with the exception of interior floors (floors will be sealed after clearance). The Supervisor should perform an inspection for visible dust and debris.

Additional cleaning cycles may be necessary for porous surfaces, and difficult to clean surfaces (crevices). Failure to meet clearance criteria will require additional cleaning.

3.18 CLEARANCE

Clearance must be performed by a California Department of Public Health Certified Lead Project Monitor. It will not be performed by the Contractor (although the Contractor may and are encouraged to perform their own clearance testing). Clearance testing must occur no sooner than one (1) hour after final cleaning. It consists of two steps; visual examination and possibly environmental sampling (dust and/or soil sampling for exterior work).

1. Visual Examination For Determination of Completed Work:

This is a determination that the work specified in the scope of work has been completed satisfactorily. For surfaces that are to be re-painted, it is important this examination occurs

prior to the re-painting (to determine that either all the paint has been removed [abatement] or that the deteriorated paint has been stabilized [interim controls]). Next the surfaces should be examined for settled dust and debris. If dust or debris is visually noted, the Contractor will be asked to re-clean prior to samples being collected.

If no such dust/debris is found, the independent consultant or Project Monitor will complete a Certificate of Visual Inspection (Appendix B) for the area or for multiple areas. The Certified Supervisor will also sign this Certificate. The completed form should be submitted to the City at the end of the project.

2. Environmental Sampling:

The number and location of dust and/or soil samples will be determined on a case-by-case basis. The clearance criterion to be used is shown in the table below:

Surface	Level
Interior Floors	40 µg/ft ²
Interior Window Sills	250 µg/ft ²
Exterior Horizontal Surfaces	40 µg/ft ²
Exterior Soil*	1000 µg/ft ²
Soil in Play Areas*	400 µg/ft ²

* Soil may not be impacted as a part of the proposed work but if contamination occurs than levels shall be used for clearances. Contractor may take background soil samples to determine the preexisting soil conditions.

Re-cleaning, at the Contractor’s expense, will be required for surfaces that do not pass clearance criteria.

The cost for additional tests, which may be required as a result of samples failing to meet the release criteria, shall be paid for the Contractor. This cost shall include all costs associated with sample analysis and collection of additional samples, including Consultant fees.

3.19 DISPOSAL OF LEAD WASTE

3.20 WASTE MINIMIZATION

The Contractor is required to make all reasonable efforts to minimize the amount of hazardous waste generated from this project.

3.21 WASTE CHARACTERIZATION

The Contractor shall test any potential hazardous waste generated in accordance with 22 CCR Division 4.5 within ten (10) days and/or prior to the end of the project to determine if it is hazardous waste and requires disposal. All paint chips will be considered hazardous waste and do not require testing. Components with lead paint that has been stabilized shall have a hazardous waste determination made prior to sending to a landfill.

3.22 PRE-TRANSPORTATION REQUIREMENTS

Any packaging used to ship hazardous waste off site such as a container, roll-off bin, tank or

other device, must comply with 49 CFR Parts 173, 178, 179 and be labeled and prepared for transportation in accordance with 22 CCR Article 3.

The hazardous waste label must be affixed and filled out when the first amount of hazardous waste is placed in the container. The label must include the initial accumulation date.

All additional pre-transportation labeling, marking or placarding must be conducted prior to transporting off site and in accordance with 22 CCR Chapter 12, Article 3.

All containers and tanks of hazardous waste must be managed in a way which minimizes the threat of fire, explosion, or any unplanned sudden or non-sudden release of hazardous waste to the air, soil or surface water which could threaten human health or the environment.

Management techniques include containment areas capable of holding the contents of largest container within the containment area. Properly store and secure waste at all times. Do not leave hazardous waste in uncovered or unlocked trucks or dumpsters.

3.23 TRANSPORTATION AND DISPOSAL

A hazardous waste manifest will be completed in accordance with 22 CCR Chapter 12, Article 2 for each shipment of hazardous waste leaving the work site. All waste shall leave the project site by the end of the project. Only The Project Monitor employees shall sign as the generator on manifests.

Disposal of the lead related hazardous wastes shall be by incineration.

APPENDIX A

CERTIFICATE OF LEAD WORKER'S ACKNOWLEDGMENT

PROJECT NAME: _____ DATE: _____
PROJECT ADDRESS: _____
CONTRACTOR'S NAME: _____

Working with lead can be dangerous. Inhaling and ingesting lead dust can cause an increase in blood lead levels which can lead to adverse health effects such as kidney damage, elevated blood pressure or infertility.

Your employer's contract with the City for the above project requires that: You be supplied with the proper respirator and be trained in its use. You be trained in safe work practices and in the use of the equipment found on the job. You receive a medical examination. These items are to have been done at no cost to you.

RESPIRATORY PROTECTION: You must have been trained in the proper use of respirators, and informed of the type respirator to be used on the above referenced project. You must be given a copy of the written respiratory protection manual issued by your employer. You must be equipped at no cost with the respirator to be used on the above project.

TRAINING COURSE: You must be an EPA certified Renovation, Repair, and Painting (RRP) Contractor or received training from an RRP contractor and be able to provide onsite documentation of training. You should have been trained in the dangers inherent in handling lead and breathing and ingesting lead dust and in proper work procedures and personal and area protective measures. The topics covered in the course must have included the following:

- Possible routes of exposure to lead
- Health hazards associated with lead
- Respiratory protection
- Use of protective equipment
- Work practices including hands on or on-the-job training
- Personal decontamination procedures
- Health and safety considerations

MEDICAL EXAMINATION: You must have had a medical examination within the past 12 months at no cost to you. This examination must have included: health history, physical examination, a blood pressure measurement, pulmonary function test and blood sample and analysis for lead.

By signing this document you are acknowledging only that the City has advised you of your rights to training and protection relative to your employer, the Contractor.

Signature: _____ Social Security No.: _____

Printed Name: _____

Witness (print): _____ Witness Signature: _____

APPENDIX B

CERTIFICATION OF VISUAL INSPECTION

Project # _____ Date: _____ Location: _____

Contractor: _____

The contractor hereby certifies that he/she has visually inspected the Work Area (all surfaces including pipes, counters, ledges, walls, ceiling and floor, behind critical barriers, sheet plastic, etc.) and has found no dust, debris or residue.

by: (Signature): _____ Date: _____

(Print Name): _____

(Company Name): _____

(Print Title): _____

CITY ALMP REPRESENTATIVE

The City ALMP Representative hereby certifies that he has accompanied the contractor on his/her visual inspection and verifies that this inspection has been thorough and to the best of his/her knowledge and belief, the contractor's certification above is a true and honest one.

by: (Signature): _____ Date: _____

(Print Name): _____

WORK AREA

Location: _____

Room: _____

Hazard Reduction Performed:

APPENDIX C

LABORATORY RESULTS

Sewer Pump Station 23T Samples Collected on 1/13/2016			
Sample #	Location	Condition	Lead Content
245	Pipe	Intact	.7 mg/cm ²
246	Pipe Support Brackets	Intact	1.0 mg/cm ²

APPENDIX H
LEAD AND ASBESTOS REPORTS

7247

RECEIVED
JAN 07 2016

CITY of SAN DIEGO 4840

WORK REQUEST FOR ASBESTOS & LEAD MANAGEMENT PROGRAM

Department Public Works Dept# 2112 Division Architectural Engineering & Parks

Work Requested By Rolf H Lee MS# 908A Phone/Fax 619.533.4660

Facility Name/Address Sewer Pump Station 23T / 1450 Cactus Road; San Diego, CA 92154

Facility # 900002 Age of Facility: 19 87 Plans Attached? YES NO Target Start: mid-2016

Description of Proposed Work (explain detail of work as well as what part of facility)

Replacement of two pumps, suction and discharge pipe replacement, access hatch replacement, removal of the two electrical panels in the dry well, hoist and trolley replacement, supply and exhaust fan replacement, wet well sluice gate replacement, installing a new telemetry panel, installation of a new bypass pumping connection, odor control, lighting replacement, etc.

Have internal order or WBS # opened to ALMP for labor cost. ALMP cost center 211511111; fund 100000; revenue acct 424071. The following accounting #s are for laboratory, abatement, and/or other NPE. Request estimate if needed.

Accounting Numbers:	<u>2011131412</u>	<u>700008</u>	<u>512029</u>	<u>B-14131</u>
	Cost Center	Fund	G/L	Internal Order/WBS #

I have the authority to authorize ALMP to bill hourly inspection labor and laboratory expenses to the accounting numbers above for work related to this project.

Signature Rolf H. Lee Title Project Manager Date 1/6/2016

Print Name Rolf H Lee Div. Analyst Name Agnes Toledo

Send completed form to: ASBESTOS & LEAD MANAGEMENT PROGRAM - 9601 Ridgeway Court, Suite 320, San Diego, CA 92123 or MS 1103-A or Fax (858)492-5089

FOR OFFICE USE ONLY

Date Received 1-7-16

Inspector B. Blondek

Records/Inspection Information _____

Impact on Project Lead containing paint exists at the site. ALMP will provide an abatement specification for lead. Please see attached testing results.

Wm Brad Blondek
ASBESTOS & LEAD PROGRAM INSPECTOR

1-19-16
DATE

[Signature]
ASBESTOS & LEAD PROGRAM MANAGER DATE 1/20/16

Asbestos & Lead Management Program -- (858) 573-1262 (FAX) (858) 492-5089



City of San Diego Asbestos Lead Management Program

Sewer Pump Station 23T, 2390 Cactus Road, San Diego CA 92154



XRF Assay Results

Reading No	Time	Type	Duration	Mode	Location	Room	Side	Component	Condition	Substrate	Color	Results	PbC	Units
241	#####	ShutterCal	60										6.42	cps
242	#####	Paint	20	K & L				CALIB. CHECK			RED	Positive	1	mg / cm ^2
243	#####	Paint	20	K & L				CALIB. CHECK			RED	Positive	1.1	mg / cm ^2
244	#####	Paint	20	K & L				CALIB. CHECK			RED	Positive	1.1	mg / cm ^2
245	#####	Paint	20	K & L	2390 CACTUS RD	SPS 23T	A	PIPE	INTACT	METAL	RED	Negative	0.7	mg / cm ^2
246	#####	Paint	20	K & L	2390 CACTUS RD	SPS 23T	A	BRACKET SUPPORT	INTACT	METAL	RED	Positive	1	mg / cm ^2
247	#####	Paint	20	K & L	2390 CACTUS RD	SPS 23T	A	PUMP HOUSING	INTACT	METAL	BLUE	Negative	0	mg / cm ^2
248	#####	Paint	20	K & L	2390 CACTUS RD	SPS 23T	A	PUMP HOUSING	INTACT	METAL	GRAY	Negative	0.03	mg / cm ^2
249	#####	Paint	20	K & L	2390 CACTUS RD	SPS 23T	A	GENERATOR	INTACT	METAL	GRAY	Negative	0.02	mg / cm ^2
250	#####	Paint	20	K & L	2390 CACTUS RD	SPS 23T	A	GENERATOR BASE	INTACT	METAL	BLACK	Negative	0.02	mg / cm ^2
251	#####	Paint	20	K & L	2390 CACTUS RD	SPS 23T	A	BALLARD	INTACT	METAL	YELLOW	Negative	0.02	mg / cm ^2
252	#####	Paint	20	K & L				CALIB. CHECK			RED	Positive	1.1	mg / cm ^2
253	#####	Paint	20	K & L				CALIB. CHECK			RED	Positive	1.1	mg / cm ^2
254	#####	Paint	20	K & L				CALIB. CHECK			RED	Positive	1.1	mg / cm ^2



H.M. Pitt Labs, Inc.

4901 Morana Blvd · Ste 203 · San Diego, CA 92117

Lab Number: 147385-195517

Tel: 619-474-8548 · Fax: 858-412-3305

Company:

City of San Diego Environmental Services
Department
9601 Ridgehaven Court, Suite 310
San Diego, CA 92123

Date Entered: 01/14/2016
Analyzed By: Edina Zakar

Date Analyzed: 01/14/16
Customer PO / Claim#:
Contract Number:

Job Site: Project # 7247

Date Sampled: 01/13/2016
Who Sampled: Brad Blondet

Lab Notes: 72 HR TAT

POLARIZED LIGHT MICROSCOPY ANALYSIS REPORT - EPA-600/R-93/116 AND EPA-600/M4-82-020

Analysis Number: 147385-1

Customer Number: 7247-B-01

Classification:

Description: SPS 2ET, Gasket

Results: Non-Asbestos: 10% Synthetic Fibers in Black Gasket

Analysis Number: 147385-2

Customer Number: 7247-B-02

Classification:

Description: SPS 2ET, Gasket

Results: Non-Asbestos: 10% Cellulose Fibers and 20% Synthetic Fibers in Green Gasket

Analysis Number: 147385-3

Customer Number: 7247-B-03

Classification:

Description: SPS 23T, Tar on Wet Side Wall

Results: Non-Asbestos: Non-Fibrous Black Tar

Analysis Number: 147385-4

Customer Number: 7247-B-04

Classification:

Description: SPS 23T, Sealant on Stair Cover

Results: Non-Asbestos: Non-Fibrous Gray Sealant

- All samples tested as submitted to the lab, H.M. PITT LABS, INC. does not assume responsibility for the accuracy of the information submitted with the samples unless done by an employee of H.M. PITT LABS, INC.
- These test results relate only to the sample(s) identified above.
- This report may not be used to claim endorsement by NVLAP or any agency of the Federal Government.
- This report shall not be reproduced, except in full, without written approval of H.M. Pitt Labs, Inc.
- Samples are archived for 2 years from date of receipt and will be disposed of properly following this period.
- Quantitative value is based on PLM CVES (Calibrated Visual Estimates) with a detection limit of <1%.

APPROVED BY:

LELAND S. PITT, CIH

Date: 01/14/2016

REVIEWED BY:

ATTACHMENT F
INTENTIONALLY LEFT BLANK

ATTACHMENT G

CONTRACT AGREEMENT

CONTRACT AGREEMENT

CONSTRUCTION CONTRACT

This contract is made and entered into between THE CITY OF SAN DIEGO, a municipal corporation, herein called "City", and **SCW Contracting Corporation**, herein called "Contractor" for construction of **SPS 23T Reliability Improvements**; Bid No. **K-17-1475-DBB-3**; in the amount of **One Million Four Hundred Ninety Seven Thousand One Hundred Ninety Three Dollars and Zero Cents (\$1,497,193.00)** which is comprised of the Base Bid.

IN CONSIDERATION of the payments to be made hereunder and the mutual undertakings of the parties hereto, City and Contractor agree as follows:

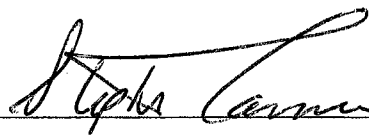
1. The following are incorporated into this contract as though fully set forth herein:
 - (a) The attached Faithful Performance and Payment Bonds.
 - (b) The attached Proposal included in the Bid documents by the Contractor.
 - (c) Reference Standards listed in the Instruction to Bidders and the Supplementary Special Provisions (SSP).
 - (d) That certain documents entitled **SPS 23T Reliability Improvements**, on file in the office of the Public Works Department as Document No. **B-14131**, as well as all matters referenced therein.
2. The Contractor shall perform and be bound by all the terms and conditions of this contract and in strict conformity therewith shall perform and complete in a good and workmanlike manner **SPS 23T Reliability Improvements**, Bid Number **K-17-1475-DBB-3**, San Diego, California.
3. For such performances, the City shall pay to Contractor the amounts set forth at the times and in the manner and with such additions or deductions as are provided for in this contract, and the Contractor shall accept such payment in full satisfaction of all claims incident to such performances.
4. No claim or suit whatsoever shall be made or brought by Contractor against any officer, agent, or employee of the City for or on account of anything done or omitted to be done in connection with this contract, nor shall any such officer, agent, or employee be liable hereunder.
5. This contract is effective as of the date that the Mayor or designee signs the agreement.

CONTRACT AGREEMENT (continued)


IN WITNESS WHEREOF, this Agreement is signed by the City of San Diego, acting by and through its Mayor or designee, pursuant to Municipal Code **§22.3102** authorizing such execution.

THE CITY OF SAN DIEGO

APPROVED AS TO FORM

By 

Mara W. Elliott, City Attorney

By 

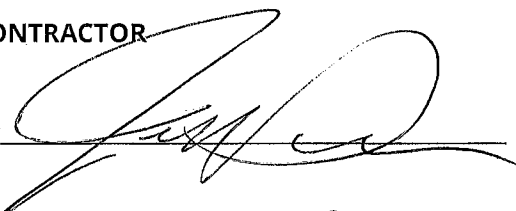
Print Name: Stephen Samara
Principal Contract Specialist
Public Works Department

Print Name: Christine Leone
Deputy City Attorney

Date: 8-7-17

Date: 8/7/17

CONTRACTOR

By 

Print Name: JEFFREY SCRAPE

Title: PRESIDENT

Date: JUNE 22ND 2017

City of San Diego License No.: B2013008800

State Contractor's License No.: 630435

DEPARTMENT OF INDUSTRIAL RELATIONS (DIR) REGISTRATION NUMBER: 1000001579

CERTIFICATIONS AND FORMS

The Bidder, by submitting its electronic bid, agrees to and certifies under penalty of perjury under the laws of the State of California, that the certifications, forms and affidavits submitted as part of this bid are true and correct.

Bidder's General Information

To the City of San Diego:

Pursuant to "Notice Inviting Bids", specifications, and requirements on file with the City Clerk, and subject to all provisions of the Charter and Ordinances of the City of San Diego and applicable laws and regulations of the United States and the State of California, the undersigned hereby proposes to furnish to the City of San Diego, complete at the prices stated herein, the items or services hereinafter mentioned. The undersigned further warrants that this bid is not made in the interest of, or on behalf of, any undisclosed person, partnership, company, association, organization, or corporation; that the bid is genuine and not collusive or sham; that the bidder has not directly or indirectly induced or solicited any other bidder to put in a false or sham bid, and has not directly or indirectly colluded, conspired, connived, or agreed with any bidder or anyone else to put in a sham bid, or that anyone shall refrain from bidding; that the bidder has not in any manner, directly or indirectly, sought by agreement, communication, or conference with anyone to fix the bid price of the bidder or any other bidder, or to fix any overhead, profit, or cost element of the bid price, or of that of any other bidder, or to secure any advantage against the public body awarding the contract of anyone interested in the proposed contract; that all statements contained in the bid are true; and, further, that the bidder has not, directly or indirectly, submitted his or her bid price or any breakdown thereof, or the contents thereof, or divulged information or data relative thereto, or paid, and will not pay, any fee to any corporation, partnership, company, association, organization, bid depository, or to any member or agent thereof to effectuate a collusive or sham bid.

The undersigned bidder(s) further warrants that bidder(s) has thoroughly examined and understands the entire Contract Documents (plans and specifications) and the Bidding Documents therefore, and that by submitting said Bidding Documents as its bid proposal, bidder(s) acknowledges and is bound by the entire Contract Documents, including any addenda issued thereto, as such Contract Documents incorporated by reference in the Bidding Documents.

**NON-COLLUSION AFFIDAVIT TO BE EXECUTED BY BIDDER AND SUBMITTED WITH BID UNDER 23
UNITED STATES CODE 112 AND PUBLIC CONTRACT CODE 7106**

State of California

County of San Diego

The bidder, being first duly sworn, deposes and says that he or she is authorized by the party making the foregoing bid that the bid is not made in the interest of, or on behalf of, any undisclosed person, partnership, company, association, organization, or corporation; that the bid is genuine and not collusive or sham; that the bidder has not directly or indirectly induced or solicited any other bidder to put in a false or sham bid, and has not directly or indirectly colluded, conspired, connived, or agreed with any bidder or anyone else to put in a sham bid, or that anyone shall refrain from bidding; that the bidder has not in any manner, directly or indirectly, sought by agreement, communication, or conference with anyone to fix the bid price of the bidder or any other bidder, or to fix any overhead, profit, or cost element of the bid price, or of that of any other bidder, or to secure any advantage against the public body awarding the contract of anyone interested in the proposed contract; that all statements contained in the bid are true; and further, that the bidder has not, directly or indirectly, submitted his or her bid price or any breakdown thereof, or the contents thereof, or divulged information or data relative thereto, or paid, and will not pay, any fee to any corporation, partnership, company association, organization, bid depository, or to any member or agent thereof to effectuate a collusive or sham bid.

CONTRACTOR CERTIFICATION

DRUG-FREE WORKPLACE

I hereby certify that I am familiar with the requirements of San Diego City Council Policy No. 100-17 regarding Drug-Free Workplace as outlined in the WHITEBOOK, Section 7-13.3, "Drug-Free Workplace", of the project specifications, and that;

This company_has in place a drug-free workplace program that complies with said policy. I further certify that each subcontract agreement for this project contains language which indicates the subcontractor's agreement to abide by the provisions of subdivisions a) through c) of the policy as outlined.

CONTRACTOR CERTIFICATION

AMERICAN WITH DISABILITIES ACT (ADA) COMPLIANCE CERTIFICATION

I hereby certify that I am familiar with the requirements of San Diego City Council Policy No. 100-4 regarding the American With Disabilities Act (ADA) outlined in the WHITEBOOK, Section 7-13.2, "American With Disabilities Act", of the project specifications, and that:

This company has in place workplace program that complies with said policy. I further certify that each subcontract agreement for this project contains language which indicates the subcontractor's agreement to abide by the provisions of the policy as outlined.

CONTRACTOR CERTIFICATION

CONTRACTOR STANDARDS – PLEDGE OF COMPLIANCE

I declare under penalty of perjury that I am authorized to make this certification on behalf of the company submitting this bid/proposal, that as Contractor, I am familiar with the requirements of City of San Diego Municipal Code § 22.3004 regarding Contractor Standards as outlined in the WHITEBOOK, Section 7-13.4, ("Contractor Standards"), of the project specifications, and that Contractor has complied with those requirements.

I further certify that each of the Contractor's subcontractors whose subcontracts are greater than \$50,000 in value has completed a Pledge of Compliance attesting under penalty of perjury of having complied with City of San Diego Municipal Code § 22.3004.

AFFIDAVIT OF DISPOSAL

(To be submitted upon completion of Construction pursuant to the contracts Certificate of Completion)

WHEREAS, on the _____ DAY OF _____, 2_____ the undersigned entered into and executed a contract with the City of San Diego, a municipal corporation, for:

SPS 23T Reliability Improvements

(Name of Project or Task)

as particularly described in said contract and identified as Bid No. **K-17-1475-DBB-3** ; SAP No. (WBS/IO/CC) **B-14131**; and **WHEREAS**, the specification of said contract requires the Contractor to affirm that "all brush, trash, debris, and surplus materials resulting from this project have been disposed of in a legal manner"; and **WHEREAS**, said contract has been completed and all surplus materials disposed of:

NOW, THEREFORE, in consideration of the final payment by the City of San Diego to said Contractor under the terms of said contract, the undersigned Contractor, does hereby affirm that all surplus materials as described in said contract have been disposed of at the following location(s)

and that they have been disposed of according to all applicable laws and regulations.

Dated this _____ DAY OF _____, _____.

By: _____
Contractor

ATTEST:

State of _____ County of _____

On this _____ DAY OF _____, 2_____, before the undersigned, a Notary Public in and for said County and State, duly commissioned and sworn, personally appeared _____ known to me to be the _____ Contractor named in the foregoing Release, and whose name is subscribed thereto, and acknowledged to me that said Contractor executed the said Release.

Notary Public in and for said County and State

CONTRACTOR CERTIFICATION

Equal Benefits Ordinance Certification

I declare under penalty of perjury that I am familiar with the requirements of and in compliance with the City of San Diego Municipal Code § 22.4300 regarding Equal Benefits Ordinance.

LIST OF SUBCONTRACTORS

***** PROVIDED FOR ILLUSTRATIVE PURPOSES ONLY *** TO BE SUBMITTED IN ELECTRONIC FORMAT ONLY *** SEE INSTRUCTIONS TO BIDDERS, FOR FURTHER INFORMATION**

In accordance with the requirements of the "Subletting and Subcontracting Fair Practices Act", Section 4100, of the California Public Contract Code (PCC), the Bidder is to list below the name, address and license number of each Subcontractor who will perform work, labor, render services or specially fabricate and install a portion [type] of the work or improvement, in an amount of or in excess of 0.5% of the Contractor's total Bid. Failure to comply with this requirement may result in the Bid being rejected as non-responsive. The Contractor is to list only one Subcontractor for each portion of the Work. The Bidder's attention is directed to the Special Provisions - General; Paragraph 2-3 Subcontracts, which stipulates the percentage of the Work to be performed with the Bidder's own forces. The Bidder is to also list all SLBE, ELBE, DBE, DVBE, MBE, WBE, OBE, SDB, WoSB, HUBZone, and SDVOSB Subcontractors for which the Bidders are seeking recognition towards achieving any mandatory, voluntary, or both subcontracting participation percentages.

NAME, ADDRESS AND TELEPHONE NUMBER OF SUBCONTRACTOR	CONSTRUCTOR OR DESIGNER	SUBCONTRACTOR LICENSE NUMBER	TYPE OF WORK	DOLLAR VALUE OF SUBCONTRACT	MBE, WBE, DBE, DVBE, OBE, ELBE, SLBE, SDB, WoSB, HUBZone, OR SDVOSB ^①	WHERE CERTIFIED ^②	CHECK IF JOINT VENTURE PARTNERSHIP
Name: _____ Address: _____ City: _____ State: _____ Zip: _____ Phone: _____ Email: _____							
Name: _____ Address: _____ City: _____ State: _____ Zip: _____ Phone: _____ Email: _____							

① As appropriate, Bidder shall identify Subcontractor as one of the following and shall include a valid proof of certification (except for OBE, SLBE and ELBE):

Certified Minority Business Enterprise	MBE	Certified Woman Business Enterprise	WBE
Certified Disadvantaged Business Enterprise	DBE	Certified Disabled Veteran Business Enterprise	DVBE
Other Business Enterprise	OBE	Certified Emerging Local Business Enterprise	ELBE
Certified Small Local Business Enterprise	SLBE	Small Disadvantaged Business	SDB
Woman-Owned Small Business	WoSB	HUBZone Business	HUBZone
Service-Disabled Veteran Owned Small Business	SDVOSB		

② As appropriate, Bidder shall indicate if Subcontractor is certified by:

City of San Diego	CITY	State of California Department of Transportation	CALTRANS
California Public Utilities Commission	CPUC		
State of California's Department of General Services	CADoGS	City of Los Angeles	LA
State of California	CA	U.S. Small Business Administration	SBA

The Bidder will not receive any subcontracting participation percentages if the Bidder fails to submit the required proof of certification.

NAMED EQUIPMENT/MATERIAL SUPPLIER LIST

*** PROVIDED FOR ILLUSTRATIVE PURPOSES ONLY *** TO BE SUBMITTED IN ELECTRONIC FORMAT ONLY *** SEE INSTRUCTIONS TO BIDDERS FOR FURTHER INFORMATION

NAME, ADDRESS AND TELEPHONE NUMBER OF VENDOR/SUPPLIER	MATERIALS OR SUPPLIES	DOLLAR VALUE OF MATERIAL OR SUPPLIES	SUPPLIER (Yes/No)	MANUFACTURER (Yes/No)	MBE, WBE, DBE, DVBE, OBE, ELBE, SLBE, SDB, WoSB, HUBZone, OR SDVOSB [ⓐ]	WHERE CERTIFIED [ⓑ]
Name: _____ Address: _____ City: _____ State: _____ Zip: _____ Phone: _____ Email: _____						
Name: _____ Address: _____ City: _____ State: _____ Zip: _____ Phone: _____ Email: _____						

- ⓐ As appropriate, Bidder shall identify Vendor/Supplier as one of the following and shall include a valid proof of certification (except for OBE,SLBE and ELBE):
- | | | | |
|---|--------|--|---------|
| Certified Minority Business Enterprise | MBE | Certified Woman Business Enterprise | WBE |
| Certified Disadvantaged Business Enterprise | DBE | Certified Disabled Veteran Business Enterprise | DVBE |
| Other Business Enterprise | OBE | Certified Emerging Local Business Enterprise | ELBE |
| Certified Small Local Business Enterprise | SLBE | Small Disadvantaged Business | SDB |
| Woman-Owned Small Business | WoSB | HUBZone Business | HUBZone |
| Service-Disabled Veteran Owned Small Business | SDVOSB | | |
- ⓑ As appropriate, Bidder shall indicate if Vendor/Supplier is certified by:
- | | | | |
|--|--------|--|----------|
| City of San Diego | CITY | State of California Department of Transportation | CALTRANS |
| California Public Utilities Commission | CPUC | | |
| State of California's Department of General Services | CADoGS | City of Los Angeles | LA |
| State of California | CA | U.S. Small Business Administration | SBA |

The Bidder will not receive any subcontracting participation percentages if the Bidder fails to submit the required proof of certification.

ELECTRONICALLY SUBMITTED FORMS

THE FOLLOWING FORMS MUST BE SUBMITTED IN PDF FORMAT WITH BID SUBMISSION

The following forms are to be completed by the bidder and submitted (uploaded) electronically with the bid in PlanetBids.

- A. BID BOND – See Instructions to Bidders, Bidders Guarantee of Good Faith (Bid Security) for further instructions**

- B. CONTRACTOR’S CERTIFICATION OF PENDING ACTIONS**

Bids will not be accepted until ALL forms are submitted as part of the bid submittal

BID BOND

**See Instructions to Bidders, Bidder Guarantee of Good Faith
(Bid Security)**

KNOW ALL MEN BY THESE PRESENTS,

That SCW CONTRACTING CORPORATION as Principal, and
LIBERTY MUTUAL INSURANCE COMPANY as Surety, are

held and firmly bound unto The City of San Diego hereinafter called "OWNER," in the sum of **10% OF THE TOTAL BID AMOUNT** for the payment of which sum, well and truly to be made, we bind ourselves, our heirs, executors, administrators, successors, and assigns, jointly and severally, firmly by these presents.

WHEREAS, said Principal has submitted a Bid to said OWNER to perform the WORK required under the bidding schedule(s) of the OWNER's Contract Documents entitled

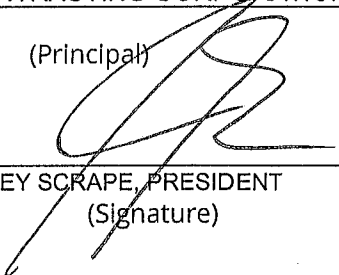
SPS 23T RELIABILITY IMPROVEMENTS

NOW THEREFORE, if said Principal is awarded a contract by said OWNER and, within the time and in the manner required in the "Notice Inviting Bids" enters into a written Agreement on the form of agreement bound with said Contract Documents, furnishes the required certificates of insurance, and furnishes the required Performance Bond and Payment Bond, then this obligation shall be null and void, otherwise it shall remain in full force and effect. In the event suit is brought upon this bond by said OWNER and OWNER prevails, said Surety shall pay all costs incurred by said OWNER in such suit, including a reasonable attorney's fee to be fixed by the court.

SIGNED AND SEALED, this 8TH day of MAY, 2017

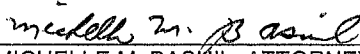
SCW CONTRACTING CORPORATION (SEAL)

(Principal)

By: 
JEFFREY SCRAPE, PRESIDENT
(Signature)

LIBERTY
MUTUAL INSURANCE COMPANY (SEAL)

(Surety)

By: 
MICHELLE M. BASUIL, ATTORNEY-IN-FACT
(Signature)

(SEAL AND NOTARIAL ACKNOWLEDGEMENT OF SURETY)

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.

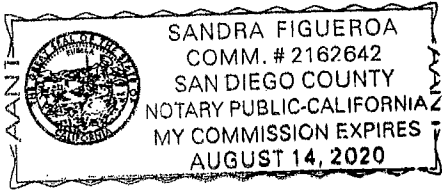
State of California)
County of SAN DIEGO)

On 5/8/2017 before me, SANDRA FIGUEROA, NOTARY PUBLIC,
Date Here Insert Name and Title of the Officer
personally appeared MICHELLE M. BASUIL
Name(s) of Signer(s)

who 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 Sandra Figueroa
Signature of Notary Public

Place Notary Seal Above

OPTIONAL

Though this section is optional, completing this information can deter alteration of the document or fraudulent reattachment of this form to an unintended document.

Description of Attached Document

Title or Type of Document: _____ Document Date: _____
Number of Pages: _____ Signer(s) Other Than Named Above: _____

Capacity(ies) Claimed by Signer(s)

Signer's Name: MICHELLE M. BASUIL
 Corporate Officer — Title(s): _____
 Partner — Limited General
 Individual Attorney in Fact
 Trustee Guardian or Conservator
 Other: _____
Signer Is Representing: _____

Signer's Name: _____
 Corporate Officer — Title(s): _____
 Partner — Limited General
 Individual Attorney in Fact
 Trustee Guardian or Conservator
 Other: _____
Signer Is Representing: _____

THIS POWER OF ATTORNEY IS NOT VALID UNLESS IT IS PRINTED ON RED BACKGROUND.

This Power of Attorney limits the acts of those named herein, and they have no authority to bind the Company except in the manner and to the extent herein stated.

Certificate No. 7702341

Liberty Mutual Insurance Company
The Ohio Casualty Insurance Company West American Insurance Company

POWER OF ATTORNEY

KNOWN ALL PERSONS BY THESE PRESENTS: That The Ohio Casualty Insurance Company is a corporation duly organized under the laws of the State of New Hampshire, that Liberty Mutual Insurance Company is a corporation duly organized under the laws of the State of Massachusetts, and West American Insurance Company is a corporation duly organized under the laws of the State of Indiana (herein collectively called the "Companies"), pursuant to and by authority herein set forth, does hereby name, constitute and appoint, Helen Maloney; John G. Maloney; Mark D. Iatarola; Michelle M. Basuil; Sandra Figueroa

all of the city of Escondido, state of CA each individually if there be more than one named, its true and lawful attorney-in-fact to make, execute, seal, acknowledge and deliver, for and on its behalf as surety and as its act and deed, any and all undertakings, bonds, recognizances and other surety obligations, in pursuance of these presents and shall be as binding upon the Companies as if they have been duly signed by the president and attested by the secretary of the Companies in their own proper persons.

IN WITNESS WHEREOF, this Power of Attorney has been subscribed by an authorized officer or official of the Companies and the corporate seals of the Companies have been affixed thereto this 31st day of March, 2017.



The Ohio Casualty Insurance Company
Liberty Mutual Insurance Company
West American Insurance Company

By: David M. Carey
David M. Carey, Assistant Secretary

STATE OF PENNSYLVANIA ss
COUNTY OF MONTGOMERY

On this 31st day of March, 2017, before me personally appeared David M. Carey, who acknowledged himself to be the Assistant Secretary of Liberty Mutual Insurance Company, The Ohio Casualty Company, and West American Insurance Company, and that he, as such, being authorized so to do, execute the foregoing instrument for the purposes therein contained by signing on behalf of the corporations by himself as a duly authorized officer.

IN WITNESS WHEREOF, I have hereunto subscribed my name and affixed my notarial seal at King of Prussia, Pennsylvania, on the day and year first above written.



COMMONWEALTH OF PENNSYLVANIA
Notarial Seal
Teresa Pastella, Notary Public
Upper Merion Twp., Montgomery County
My Commission Expires March 28, 2021
Member, Pennsylvania Association of Notaries

By: Teresa Pastella
Teresa Pastella, Notary Public

This Power of Attorney is made and executed pursuant to and by authority of the following By-laws and Authorizations of The Ohio Casualty Insurance Company, Liberty Mutual Insurance Company, and West American Insurance Company which resolutions are now in full force and effect reading as follows:

ARTICLE IV – OFFICERS – Section 12. Power of Attorney. Any officer or other official of the Corporation authorized for that purpose in writing by the Chairman or the President, and subject to such limitation as the Chairman or the President may prescribe, shall appoint such attorneys-in-fact, as may be necessary to act in behalf of the Corporation to make, execute, seal, acknowledge and deliver as surety any and all undertakings, bonds, recognizances and other surety obligations. Such attorneys-in-fact, subject to the limitations set forth in their respective powers of attorney, shall have full power to bind the Corporation by their signature and execution of any such instruments and to attach thereto the seal of the Corporation. When so executed, such instruments shall be as binding as if signed by the President and attested to by the Secretary. Any power or authority granted to any representative or attorney-in-fact under the provisions of this article may be revoked at any time by the Board, the Chairman, the President or by the officer or officers granting such power or authority.

ARTICLE XIII – Execution of Contracts – SECTION 5. Surety Bonds and Undertakings. Any officer of the Company authorized for that purpose in writing by the chairman or the president, and subject to such limitations as the chairman or the president may prescribe, shall appoint such attorneys-in-fact, as may be necessary to act in behalf of the Company to make, execute, seal, acknowledge and deliver as surety any and all undertakings, bonds, recognizances and other surety obligations. Such attorneys-in-fact subject to the limitations set forth in their respective powers of attorney, shall have full power to bind the Company by their signature and execution of any such instruments and to attach thereto the seal of the Company. When so executed such instruments shall be as binding as if signed by the president and attested by the secretary.

Certificate of Designation – The President of the Company, acting pursuant to the Bylaws of the Company, authorizes David M. Carey, Assistant Secretary to appoint such attorneys-in-fact as may be necessary to act on behalf of the Company to make, execute, seal, acknowledge and deliver as surety any and all undertakings, bonds, recognizances and other surety obligations.

Authorization – By unanimous consent of the Company's Board of Directors, the Company consents that facsimile or mechanically reproduced signature of any assistant secretary of the Company, wherever appearing upon a certified copy of any power of attorney issued by the Company in connection with surety bonds, shall be valid and binding upon the Company with the same force and effect as though manually affixed.

I, Renee C. Llewellyn, the undersigned, Assistant Secretary, The Ohio Casualty Insurance Company, Liberty Mutual Insurance Company, and West American Insurance Company do hereby certify that the original power of attorney of which the foregoing is a full, true and correct copy of the Power of Attorney executed by said Companies, is in full force and effect and has not been revoked.

IN TESTIMONY WHEREOF, I have hereunto set my hand and affixed the seals of said Companies this 8TH day of MAY, 2017.



By: Renee C. Llewellyn
Renee C. Llewellyn, Assistant Secretary

To confirm the validity of this Power of Attorney call 1-610-832-8240 between 9:00 am and 4:30 pm EST on any business day.

Not valid for mortgage, note, loan, letter of credit, currency rate, interest rate or residual value guarantees.

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 San Diego)

On May 10, 2017 before me, S.L. Coleman, Notary Public,
Date Here Insert Name and Title of the Officer

personally appeared Jeffrey Scrape
Name(s) of Signer(s)

who 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 S.L. Coleman
Signature of Notary Public

Place Notary Seal Above

OPTIONAL

Though this section is optional, completing this information can deter alteration of the document or fraudulent reattachment of this form to an unintended document.

Description of Attached Document

Title or Type of Document: Bid Bond Document Date: May 8, 2017
Number of Pages: 1 Signer(s) Other Than Named Above: _____

Capacity(ies) Claimed by Signer(s)

Signer's Name: Jeffrey Scrape
 Corporate Officer — Title(s): President
 Partner — Limited General
 Individual Attorney in Fact
 Trustee Guardian or Conservator
 Other: _____
Signer Is Representing: _____
SCW Contracting Corporation

Signer's Name: _____
 Corporate Officer — Title(s): _____
 Partner — Limited General
 Individual Attorney in Fact
 Trustee Guardian or Conservator
 Other: _____
Signer Is Representing: _____



CONTRACTOR'S CERTIFICATION OF PENDING ACTIONS

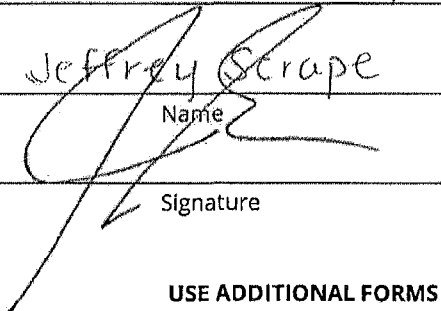
As part of its bid or proposal (Non-Price Proposal in the case of Design-Build contracts), the Bidder shall provide to the City a list of all instances within the past 10 years where a complaint was filed or pending against the Bidder in a legal or administrative proceeding alleging that Bidder discriminated against its employees, subcontractors, vendors or suppliers, and a description of the status or resolution of that complaint, including any remedial action taken.

CHECK ONE BOX ONLY.

- The undersigned certifies that within the past 10 years the Bidder has NOT been the subject of a complaint or pending action in a legal administrative proceeding alleging that Bidder discriminated against its employees, subcontractors, vendors or suppliers.
- The undersigned certifies that within the past 10 years the Bidder has been the subject of a complaint or pending action in a legal administrative proceeding alleging that Bidder discriminated against its employees, subcontractors, vendors or suppliers. A description of the status or resolution of that complaint, including any remedial action taken and the applicable dates is as follows:

DATE OF CLAIM	LOCATION	DESCRIPTION OF CLAIM	LITIGATION (Y/N)	STATUS	RESOLUTION/REMEDIAL ACTION TAKEN

Contractor Name: SCW Contracting Corp.

Certified By Jeffrey Scrape Title President
Name
 Date 05.10.17
Signature

USE ADDITIONAL FORMS AS NECESSARY

City of San Diego

CITY CONTACT: Rosa Riego, Contract Specialist, Email: RRiego@sandiego.gov
Phone No. (619) 533-3426, Fax No. (619) 533-3633

ADDENDUM B

e - Bidding



FOR

SPS 23T RELIABILITY IMPROVEMENTS

BID NO.: K-17-1475-DBB-3
SAP NO. (WBS/IO/CC).: B-14131
CLIENT DEPARTMENT: 2000
COUNCIL DISTRICT: 8
PROJECT TYPE: BP

BID DUE DATE:

2:00 PM

MAY 16, 2017

CITY OF SAN DIEGO

PUBLIC WORKS CONTRACTS

1010 SECOND AVENUE, 14th FLOOR, MS 614C

SAN DIEGO, CA 92101

A. CHANGES TO CONTRACT DOCUMENTS

The following changes to the Contract Documents are hereby made effective as though originally issued with the bid package. Bidders are reminded that all previous requirements to this solicitation remain in full force and effect.

B. BIDDER'S QUESTIONS

Q1. We spoke yesterday on the phone about this project. The section that mentions SCADA system improvements is 3.1 #9. Again the reason I contacted you is that the bid does not disclose any other information on these improvements, just that one line item.

A1. Drawing E-11 shows where a new SCADA antenna will be installed (and also indicates the existing SCADA antenna will be removed), and Drawing E-18 shows where the existing SCADA radio will be installed in a new Control Panel located at-grade outside the Pump Room. No other SCADA improvements are included in this project beyond what is shown on the contract drawings.

Q2. In spec 07 72 33 for the hatches on hatch #1 it calls for a 36" x 36" at the vault. On drawing M-1 it appears the hatch is 36" x 48", please clarify.

A2. Hatch #1 as shown on Drawing M-1, pertains to the Bypass Pumping Vault; this hatch is intended to be 36"x48". What was listed in spec Section 07 72 33 for Hatch #1 is incorrect.

The (2) two hatches that are installed in the Pump Room (Hatches #2 and #3) are, however, intended to be 36"x36" and their size is correctly called out in that spec section.

Q3. Please supply a paint schedule for both 09 90 00 and 09 96 56.

A3. For specification 09 90 00 see page 16 of 09 90 00 section 3.14 Coating System schedules. Coatings shall conform to the general requirements indicated in this specification for each type of exposure condition.

Specification 09 96 56 addresses the requirements for fusion-bonded epoxy lining of valves, piping and pipeline appurtenances. This specification section is referenced by other specification sections (e.g. 33 12 16, 33 12 18, 33 30 34, etc). Contractor shall provide fusion-bonded epoxy lining (and coating) consistent with the appropriate specification sections.

Q4. Please supply a sealant schedule for 07 92 00.

A4. This specification was provided for guidance should it be required. There is no immediate application shown on drawings, this would be identified by the contractor.

James Nagelvoort, Director
Public Works Department

Dated: *May 10, 2017*
San Diego, California

JN/AJ/mlw

City of San Diego

CITY CONTACT: Rosa Riego, Contract Specialist, Email: RRiego@sandiego.gov
Phone No. (619) 533-3426, Fax No. (619) 533-3633

ADDENDUM "A"



FOR

SPS 23T RELIABILITY IMPROVEMENTS

BID NO.: K-17-1475-DBB-3
SAP NO. (WBS/IO/CC).: B-14131
CLIENT DEPARTMENT: 2000
COUNCIL DISTRICT: 8
PROJECT TYPE: BP

BID DUE DATE:

2:00 PM

MAY 16, 2017

CITY OF SAN DIEGO

PUBLIC WORKS CONTRACTS

1010 SECOND AVENUE, 14th FLOOR, MS 614C

SAN DIEGO, CA 92101

A. CHANGES TO CONTRACT DOCUMENTS

The following changes to the Contract Documents are hereby made effective as though originally issued with the bid package. Bidders are reminded that all previous requirements to this solicitation remain in full force and effect.

B. NOTICE INVITING BIDS

1. To Notice Inviting Bids, page 4, Item 7, SUBCONTRACTING PARTICIPATION PERCENTAGES, subitem 7.1., **DELETE** in its entirety and **SUBSTITUTE** with the following:

- 7.1. The City has incorporated **mandatory** SLBE-ELBE subcontractor participation percentages to enhance competition and maximize subcontracting opportunities. For the purpose of achieving the mandatory subcontractor participation percentages, a recommended breakdown of the SLBE and ELBE subcontractor participation percentages based upon certified SLBE and ELBE firms has also been provided to achieve the mandatory subcontractor participation percentages:

1.	SLBE participation	11.5%
2.	ELBE participation	14.4%
3.	Total mandatory participation	25.9%

C. SUPPLEMENTARY SPECIAL PROVISIONS

1. To Attachment E, Supplementary Special Provisions, page 29, Section 2, SCOPE AND CONTROL OF WORK, Subsection 2-7, SUBSURFACE DATA, item 5, **DELETE** in its entirety and **SUBSTITUTE** with the following:

5. The reports listed above are available for review by contacting the Contract Specialist or visiting:

<https://filecloud.sandiego.gov/url/540hbpk2sc5c>

2. To Attachment E, Technical Specifications, page 80, Section 01 05 00 FIELD ENGINEERING, Part 1 – General, Item 1.1. QUALITY CONTROL, **DELETE** Items A.1 and A.3 in their entirety.

James Nagelvoort, Director
Public Works Department

Dated: *April 27, 2017*
San Diego, California

JN/AJ/mlw

Bid Results

Bidder Details

Prime Self- Performance
63.84%

Vendor Name SCW Contracting Corporation
Address 2525 N Old Hwy 395
 Fallbrook, CA 92028
 United States

Respondee Jeffrey Scrape
Respondee Title President
Phone 760-728-1308 Ext. 115
Email pkogler@scwcompanies.com
Vendor Type CAU,MALE,PQUAL,SDB,Local
License # 630435
CADIR

Bid Detail

Bid Format Electronic
Submitted May 16, 2017 1:56:54 PM (Pacific)
Delivery Method
Bid Responsive
Bid Status Submitted
Confirmation # 105945
Ranking 0

Respondee Comment

Buyer Comment

Attachments

File Title	File Name	File Type
Cert of Pending Actions	UPLOAD Contractors Cert of Pending Actions.pdf	Contractor's Certification of Pending Actions
Bid Bond	UPLOAD Bid Bond.pdf	Bid Bond

Line Items

Type	Item Code	UOM	Qty	Unit Price	Line Total	Comment
	Main Bid					
1	General Construction					Reference
	237110	LS	1	\$1,374,993.00	\$1,374,993.00	010250
2	Sheeting, Shoring and Bracing					
	237110	LS	1	\$1,000.00	\$1,000.00	010250
3	Final Approval of Operation & Maintenance Manuals (or Owner's Manuals) and Master Record Documents					
	237110	LS	1	\$7,500.00	\$7,500.00	010250
4	Water Pollution Control Plan (WPCP) Development					
	541330	LS	1	\$1,000.00	\$1,000.00	01 02 50
5	Water Pollution Control Plan (WPCP) Implementation					
	237110	LS	1	\$3,500.00	\$3,500.00	01 02 50

Bid Results

Type	Item Code	UOM	Qty	Unit Price	Line Total	Comment
6	Bonds (Payment and Performance)					Reference
	524126	LS	1	\$19,500.00	\$19,500.00	2-4.1
7	Field Orders (EOC Type II)					
		AL	1	\$70,000.00	\$70,000.00	9-3.5
8	Treatment and Disposal of Contaminated Ground Water and Contaminated Soil (EOC Type I)					
	237110	AL	1	\$3,700.00	\$3,700.00	01 02 50
9	Dewatering Effluent Discharge Fee (EOC Type I)					
	237110	AL	1	\$11,000.00	\$11,000.00	01 02 50
10	Lead Abatement and Disposal (EOC Type I)					
	238990	AL	1	\$5,000.00	\$5,000.00	01 02 50
				Subtotal	\$1,497,193.00	
				Total	\$1,497,193.00	

Subcontractors

Name & Address	Description	License Num	CADIR	Amount	Type
Tharsos Inc 7839 University Ave, #210 La Mesa, CA 91942 United States	Furnish & Install Sewer Pumps ELBE / SLBE	980621	1000012874	\$165,000.00	LAT,MALE,DBE,PQU AL
D. Lowen Electric, Inc. 2194 Alessandro Trail Vista, CA 92084 United States	Electrical & Controls ELBE / SLBE	932473	1000007171	\$376,452.00	CADIR