City of San Diego

CONTRACTOR'S NAME: West Coast General Corporation/PK Mechanical Systems, Inc. A Joint Venture
ADDRESS: 13700 Stowe Dr., Suite #100, Poway, CA 92064
TELEPHONE NO.: 619-561-4200 ext. 118 **FAX NO.:** 619-561-4205
CITY CONTACT: Michelle Muñoz, Contract Specialist, Email: MichelleM@sandiego.gov
Phone No. (619) 533-3482, Fax No. (619) 533-3633
J. Stohr / A. Jaro / LJI

BIDDING DOCUMENTS

e - Bidding

ORIGINAL

FOR

69TH & MOHAWK PUMP STATION

BID NO.: **K-17-1401-DBB-3**
SAP NO. (WBS/IO/CC): **S-12011**
CLIENT DEPARTMENT: **2000**
COUNCIL DISTRICT: **9**
PROJECT TYPE: **BJ**

THIS CONTRACT IS SUBJECT TO THE FOLLOWING:

- PHASED-FUNDING
- FEDERAL EQUAL OPPORTUNITY CONTRACTING REQUIREMENTS.
- PREVAILING WAGE RATES: STATE ☒ FEDERAL ☒
- APPRENTICESHIP
- THIS IS A SDWSRF FUNDED CONTRACT THROUGH THE STATE OF CALIFORNIA

BID DUE DATE:

2:00 PM
NOVEMBER 10, 2016
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:

1) Registered Engineer — Date: 9/26/2014 — Seal:

2) For City Engineer — Date: 9/26/2014 — Seal

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CITY OF SAN DIEGO, CALIFORNIA

NOTICE INVITING BIDS

1. **SUMMARY OF WORK:** This is the City of San Diego's (City) solicitation process to acquire Construction services for **69TH & MOHAWK PUMP STATION**. 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 website: http://www.sandiego.gov.

3. **ESTIMATED CONSTRUCTION COST:** The City's estimated construction cost for this project is **$11,000,000.**

4. **BID DUE DATE AND TIME ARE:** November 10, 2016 at 2:00PM.

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:**

   7.1. The City affirms that in any contract entered into pursuant to this advertisement, DBE will be afforded full opportunity to submit Bids in response to this invitation.

   7.2. This Federally assisted project includes subcontracting participation percentages for DBE participation. DBE goal commitments and Good Faith Efforts (GFE) shall be made prior to bidding. DBE commitments and GFE made after the Bid opening will not be considered for the Award of Contract.

   7.3. This project is subject to the federal equal opportunity regulations and the following requirements. The City reserves the right to audit the Contractor's compliance with the federal requirements set forth below.

   7.4. Following are federally subcontracting participation percentages for this contract.

   7.5. **Environmental Protection Agency (EPA) -** In accordance with EPA's Program for Utilization of Small, Minority Disadvantaged and Women Business Enterprises in procurement under Federal assistance programs, the Contractor agrees to the applicable "fair share" objectives negotiated with EPA as follows:

7.6. State Water Resource Control Board - Safe Drinking Water State Revolving Fund (SDWSRF):

		MBE*	WBE*
1.	Construction	11%	4%
2.	Supplies	2%	2%
3.	Services	4%	2%
4.	Equipment (combined in above)	2%	1%

Note: MBEs and WBEs must be certified by EPA, SBA, DOT or by state, local, Tribal, or private entities whose certification criteria match EPAs in order to be counted toward MBE/WBE accomplishments. MBEs and WBEs are a part of the larger universe of DBEs.

7.7. The Bid shall be declared non-responsive if the Bidder fails the following mandatory conditions:

7.7.1. Submission of GFE documentation, as specified in the Funding Agency Provisions, Attachment D.

7.7.2. Attending the Pre-Bid Meeting.

7.7.3. Bidder's submission of 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 DBE Subcontractors shall be submitted within 4 Working Days of the Bid opening.

7.8. For additional Funding Agency Equal Opportunity Contracting Program requirements and provisions, see Attachment D.

8. PRE-BID MEETING:

Prospective Bidders are **required** 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. Failure to attend the Mandatory Pre-Bid Meeting shall result in the Bidder's Bid being deemed non-responsive.

8.1. The Pre-Bid meeting is scheduled as follows:

Date: **October 11, 2016**
Time: **10:00 AM**
Location: **1010 Second Avenue, Suite 1400, San Diego, CA 92101**
Large Conference Room

Attendance at the Pre-Bid 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.

Bidders shall not be admitted after the specified start time of the mandatory Pre-Bid Meeting.

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:	**11:30 AM**
Date:	**October 11, 2016**
Location:	**6910 Mohawk Street, San Diego, CA 92115**

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 plus all Alternates.**

10.5. Once the low bid has been determined, the City may, at its sole discretion, award the contract for the Base bid alone; or for the Base bid plus one or more alternates.

11. **SUBMISSION OF QUESTIONS:**

11.1.1. The Public Works Department is responsible for responding to questions and opening, examining, and evaluating the competitive Proposals submitted to the City for the acquisition, construction, and completion of any public improvement except when otherwise set forth in these documents. All questions related to this solicitation shall be submitted to:

Public Works Contracts
1010 Second Avenue, 14th Floor
San Diego, California, 92101
Attention: Contract Specialist Michelle Muñoz

OR:

EMAIL: Contract Specialist MichelleM@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.

12. ADDITIVE/DEDUCTIVE ALTERNATES:

12.1. The additive/deductive alternates have been established to allow the City to compare the cost of specific portions of the Work with the Project's budget and enable the City to make a decision whether to incorporate these portions prior to award. The award will be established as described in the Bid. The City reserves the right to award the Contract for the Base Bid only or for the Base Bid plus one or more Alternates.

12.2. For water pipeline projects, the Plans typically show all cut and plug and connection work to be performed by City Forces. However, Bidders shall refer to Bidding Documents to see if all or part of this work will be performed by the Contractor.

13. PHASED FUNDING: For Phased Funding Conditions, see Attachment B.

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 in 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 2-1.1.2, "Joint Venture Contractors" in The WHITEBOOK for details.

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")	2012	PITS070112-01
City of San Diego Standard Specifications for Public Works Construction ("The WHITEBOOK")*	2012	PITS070112-02

Title	Edition	Document Number
City of San Diego Standard Drawings*	2012	PITS070112-03
Caltrans Standard Specifications	2010	PITS070112-04
Caltrans Standard Plans	2010	PITS070112-05
California MUTCD	2012	PITS070112-06
City Standard Drawings - Updates Approved For Use (when specified)*	Varies	Varies
Standard Federal Equal Employment Opportunity Construction Contract Specifications and the Equal Opportunity Clause Dated 09-11-84	1984	769023
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 addendum 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 PROCESS:**

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 ACCCEPTED:** 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):**

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 Pledge of Compliance.

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.

Executed in Three (3) Original Counterparts

PERFORMANCE BOND, LABOR AND MATERIALMEN'S BOND

FAITHFUL PERFORMANCE BOND AND LABOR AND MATERIALMEN'S BOND:

West Coast General Corporation/PK Mechanical Systems, Inc. A Joint Venture, a corporation, as principal, and Fidelity and Deposit Company of Maryland, 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 Ten Million Ninety Nine Thousand One Hundred Fourteen Dollars and 65/100 ($10,099,114.65) for the faithful performance of the annexed contract, and in the sum of Ten Million Ninety Nine Thousand One Hundred Fourteen Dollars and 65/100 ($10,099,114.65) for the benefit of laborers and materialmen designted 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.

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

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

Dated March 28th, 2017

West Coast General Corporation/PK Mechanical Systems, Inc. A Joint Venture

Principal

By _____

David E. Davey, Managing Partner

Printed Name of Person Signing for Principal

Approved as to Form

Mara W. Elliott, City Attorney

By _____

Deputy City Attorney

Fidelity and Deposit Company of Maryland

Surety

By _____

Richard Hallett
Attorney-in-fact

777 S. Figueroa Street, Suite 3900

Local Address of Surety

Los Angeles, CA 90017

Local Address (City, State) of Surety

213.270.0717

Local Telephone No. of Surety

Approved:

By: _____

James Nagelvoort
Director
Department of Public Works

Premium $ 63,391.00

Premium is for contract term and subject to adjustment based on final contract price.

Bond No. 9217764

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 MAR 28 2017 (Date) before me, Jose Lemus (Insert Name of Notary exactly as it appears on the official seal), Notary Public,

personally appeared Richard Hallett (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 of Notary Public) Jose Lemus

JOSE LEMUS
Commission # 2034263
Notary Public - California
San Diego County
My Comm. Expires Jul 21, 2017

Place Notary Seal Above

OPTIONAL

Though the information below is not required by law, it may prove valuable to persons relying on the document and could prevent fraudulent removal and reattachment of the form to another 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: _____
- ☐ Individual
- ☐ Corporate Officer — Title(s): _____
- ☐ Partner ☐ Limited ☐ General
- ☑ Attorney in Fact
- ☐ Trustee
- ☐ Guardian or Conservator
- ☐ Other: _____

Signer is Representing: _____

RIGHT THUMBPRINT OF SIGNER
Top of thumb here

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

Signer is Representing: _____

RIGHT THUMBPRINT OF SIGNER
Top of thumb here

ZURICH AMERICAN INSURANCE COMPANY
COLONIAL AMERICAN CASUALTY AND SURETY COMPANY
FIDELITY AND DEPOSIT COMPANY OF MARYLAND
POWER OF ATTORNEY

KNOW ALL MEN BY THESE PRESENTS: That the ZURICH AMERICAN INSURANCE COMPANY, a corporation of the State of New York, the COLONIAL AMERICAN CASUALTY AND SURETY COMPANY, a corporation of the State of Maryland, and the FIDELITY AND DEPOSIT COMPANY OF MARYLAND a corporation of the State of Maryland (herein collectively called the "Companies"), by **GERALD F. HALEY, Vice President,** in pursuance of authority granted by Article V, Section 8, of the By-Laws of said Companies, which are set forth on the reverse side hereof and are hereby certified to be in full force and effect on the date hereof, do hereby nominate, constitute, and appoint **Richard HALLETT, Aidan SMOCK, Tim MCCLELLAN, Marta COLLETT and Jose LEMUS, all of San Diego, California, EACH** its true and lawful agent and Attorney-in-Fact, to make, execute, seal and deliver, for, and on its behalf as surety, and as its act and deed: **any and all bonds and undertakings,** and the execution of such bonds or undertakings in pursuance of these presents, shall be as binding upon said Companies, as fully and amply, to all intents and purposes, as if they had been duly executed and acknowledged by the regularly elected officers of the ZURICH AMERICAN INSURANCE COMPANY at its office in New York, New York., the regularly elected officers of the COLONIAL AMERICAN CASUALTY AND SURETY COMPANY at its office in Owings Mills, Maryland., and the regularly elected officers of the FIDELITY AND DEPOSIT COMPANY OF MARYLAND at its office in Owings Mills, Maryland., in their own proper persons.

The said Vice President does hereby certify that the extract set forth on the reverse side hereof is a true copy of Article V, Section 8, of the By-Laws of said Companies, and is now in force.

IN WITNESS WHEREOF, the said Vice-President has hereunto subscribed his/her names and affixed the Corporate Seals of the said **ZURICH AMERICAN INSURANCE COMPANY, COLONIAL AMERICAN CASUALTY AND SURETY COMPANY, and FIDELITY AND DEPOSIT COMPANY OF MARYLAND**, this 16th day of February, A.D. 2017.

ATTEST:

ZURICH AMERICAN INSURANCE COMPANY
COLONIAL AMERICAN CASUALTY AND SURETY COMPANY
FIDELITY AND DEPOSIT COMPANY OF MARYLAND

By: _____

Secretary
Eric D. Barnes

_____

Vice President
Gerald F. Haley

State of Maryland
County of Baltimore

On this 16th day of February, A.D. 2017, before the subscriber, a Notary Public of the State of Maryland, duly commissioned and qualified, **GERALD F. HALEY, Vice President, and ERIC D. BARNES, Secretary,** of the Companies, to me personally known to be the individuals and officers described in and who executed the preceding instrument, and acknowledged the execution of same, and being by me duly sworn, deposeth and saith, that he/she is the said officer of the Company aforesaid, and that the seals affixed to the preceding instrument are the Corporate Seals of said Companies, and that the said Corporate Seals and the signature as such officer were duly affixed and subscribed to the said instrument by the authority and direction of the said Corporations.

IN TESTIMONY WHEREOF, I have hereunto set my hand and affixed my Official Seal the day and year first above written.

_____

Constance A. Dunn, Notary Public
My Commission Expires: July 9, 2019

EXTRACT FROM BY-LAWS OF THE COMPANIES

"Article V, Section 8, Attorneys-in-Fact. The Chief Executive Officer, the President, or any Executive Vice President or Vice President may, by written instrument under the attested corporate seal, appoint attorneys-in-fact with authority to execute bonds, policies, recognizances, stipulations, undertakings, or other like instruments on behalf of the Company, and may authorize any officer or any such attorney-in-fact to affix the corporate seal thereto; and may with or without cause modify of revoke any such appointment or authority at any time."

CERTIFICATE

I, the undersigned, Vice President of the ZURICH AMERICAN INSURANCE COMPANY, the COLONIAL AMERICAN CASUALTY AND SURETY COMPANY, and the FIDELITY AND DEPOSIT COMPANY OF MARYLAND, do hereby certify that the foregoing Power of Attorney is still in full force and effect on the date of this certificate; and I do further certify that Article V, Section 8, of the By-Laws of the Companies is still in force.

This Power of Attorney and Certificate may be signed by facsimile under and by authority of the following resolution of the Board of Directors of the ZURICH AMERICAN INSURANCE COMPANY at a meeting duly called and held on the 15th day of December 1998.

RESOLVED: "That the signature of the President or a Vice President and the attesting signature of a Secretary or an Assistant Secretary and the Seal of the Company may be affixed by facsimile on any Power of Attorney...Any such Power or any certificate thereof bearing such facsimile signature and seal shall be valid and binding on the Company."

This Power of Attorney and Certificate may be signed by facsimile under and by authority of the following resolution of the Board of Directors of the COLONIAL AMERICAN CASUALTY AND SURETY COMPANY at a meeting duly called and held on the 5th day of May, 1994, and the following resolution of the Board of Directors of the FIDELITY AND DEPOSIT COMPANY OF MARYLAND at a meeting duly called and held on the 10th day of May, 1990.

RESOLVED: "That the facsimile or mechanically reproduced seal of the company and facsimile or mechanically reproduced signature of any Vice-President, Secretary, or Assistant Secretary of the Company, whether made heretofore or hereafter, wherever appearing upon a certified copy of any power of attorney issued by the Company, shall be valid and binding upon the Company with the same force and effect as though manually affixed.

IN TESTIMONY WHEREOF, I have hereunto subscribed my name and affixed the corporate seals of the said Companies, this ____ day of MAR 28 2017, 20____.

Michael Bond, Vice President

TO REPORT A CLAIM WITH REGARD TO A SURETY BOND, PLEASE SUBMIT ALL REQUIRED INFORMATION TO:

Zurich American Insurance Co.
Attn: Surety Claims
1299 Zurich Way
Schaumburg, IL 60196-1056

ATTACHMENTS

ATTACHMENT A

SCOPE OF WORK

SCOPE OF WORK

1. **SCOPE OF WORK:** Construction of a new water pump station, including masonry building, generator enclosure, security fencing, vehicle access gates, retaining walls, landscaping, irrigation, site work, ADA pedestrian ramps, sidewalk and the installation of thirty inch (30"), twenty four inch (24") and sixteen inch (16") water mains totaling approximately 6,800 feet, fire hydrants, valves, water main abandonment, and appurtenances serving the College and Mid-City Eastern communities.

   1.1. The Work shall be performed in accordance with:

      1.1.1. The Notice Inviting Bids and Plans numbered **38929-1-D through 38929-170-D** inclusive.

2. **ESTIMATED CONSTRUCTION COST:** The City's estimated construction cost for this project is **$11,000,000.**

3. **LOCATION OF WORK: The location of the Work is as follows:**

   a. Pump Station is located at the intersection of 69th & Mohawk in San Diego.

   b. Pipeline work is in El Cajon Boulevard., 67th - 69th Streets & Mohawk.

   c. Pipeline work is located in College Grove Drive.

4. **CONTRACT TIME:** The Contract Time for completion of the Work shall be **352 Working Days.**

   4.1. CONTRACTOR'S LICENSE CLASSIFICATION: In accordance with the provisions of California Law, the Contractor shall possess valid, appropriate license(s) 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(s) are required for this contract:

      - CLASS A

ATTACHMENT B

PHASED FUNDING PROVISIONS

PHASED FUNDING PROVISIONS

1. PHASED FUNDING:

1.1. For phased funded contracts, the City typically secures enough funds for the first 90 days of the contract prior to award. Within 10 Working Days after Bid opening date the Apparent Low Bidder must contact the Project Manager to discuss fund availability and the duration of the first phase and submit the Pre-Award Schedule to the City for approval and preparation of the first Phased Funding Schedule Agreement.

1.2. The Apparent Low Bidder will be required to provide a Pre-award Schedule in accordance with 6-1, "CONSTRUCTION SCHEDULE AND COMMENCEMENT OF THE WORK" and 9-3, "PAYMENT" prior to award of Contract.

1.3. If the Bid submitted by the Apparent Low Bidder is rejected by the City for any reason, the next Apparent Low Bidder is to provide the Pre-Award Schedule within 5 Working Days after receiving notice. This process will continue until the City has selects an Awardee or rejects all Bids.

1.4. The first Phased Funding Schedule Agreement must show the fund availability for the first phase. Upon selection of the Awardee and acceptance by the City of the Pre-Award Schedule, the City will present the first Phased Funding Schedule Agreement to you.

1.5. At the City's request, meet with the City's project manager before execution of the first Phased Funding Schedule Agreement to discuss their comments and requests for revision to the Pre-Award Schedule.

1.6. Your failure to perform any of the following may result in the Bid being rejected as non-responsive:

1. Meet with the City's project manager, if requested to do so, to discuss and respond to the City's comments regarding the Pre-Award Schedule,
2. Revise the Pre-Award Schedule as requested by the City within the specified 22 Working Days timeframe, or
3. Execute the first Phased Funding Schedule Agreement within a day after receipt.

PHASED FUNDING SCHEDULE AGREEMENT

Check one:

☒ First Phased Funding Schedule Agreement

☐ Final Phased Funding Schedule Agreement

BID NUMBER: K-17-1401-DBB-3

CONTRACT TITLE: 69th & Mohawk Pump Station

CONTRACTOR: West Coast General Corp./ PK Mechanical Systems

Funding Phase	Phase Description	Phase Start	Phase Finish	Not-to-Exceed Amount
1	Funding Phase 1 (FY'17)	NTP	8/30/2017	$3,000,000.
2A	Funding Phase 2 (FY'18)	9/1/2017	1/31/2018	$5,000,000.
2B	Funding Phase 3 (FY'18)	**2/1/2018**	**NOC**	$2,099,114.65
			Total	$10,099,114.65

Notes:

(1) City Supplement 9-3.6, "PHASED FUNDING COMPENSATION" applies.

(2) The total of all funding phases shall be equal to the TOTAL BID PRICE as shown on BID SCHEDULE 1 - PRICES.

(3) This PHASED FUNDING SCHEDULE AGREEMENT will be incorporated into the CONTRACT and shall only be revised by a written modification to the CONTRACT.

CITY OF SAN DIEGO

By: John Stohr

Name: John Stohr
Project Manager

Department Name: Public Works- Eng./ AEP

Date: March 2, 2017

CONTRACTOR

By:

Name: DAVID E. DAVEY

Title: PRESIDENT

Date: 3/29/17

-END OF PHASED FUNDING SCHEDULE AGREEMENT-

ATTACHMENT C

EQUAL OPPORTUNITY CONTRACTING PROGRAM

EQUAL OPPORTUNITY CONTRACTING PROGRAM REQUIREMENTS

1. To The WHITEBOOK, Chapter 10, Sections D and E, DELETE each in its entirety, and SUBSTITUTE with the following:

D. CITY'S EQUAL OPPORTUNITY COMMITMENT.

1. Nondiscrimination in Contracting Ordinance.

1. The Contractor, Subcontractors and Suppliers shall comply with requirements of the City's Nondiscrimination in Contracting Ordinance, San Diego Municipal Code §§22.3501 through 22.3517.

   The Contractor 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. The Contractor shall provide equal opportunity for subcontractors to participate in subcontracting opportunities. The Contractor understands and agrees that violation of this clause shall be considered a material breach of the contract and may result in contract termination, debarment, or other sanctions.

   The Contractor shall include the foregoing clause in all contracts between the Contractor and Subcontractors and Suppliers.

2. Disclosure of Discrimination Complaints. As part of its Bid or Proposal, 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 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.

3. Upon the City's request, the Contractor agrees to provide to the City, within 60 days, a truthful and complete list of the names of all Subcontractors and Suppliers that the Contractor has used in the past 5 years on any of its contracts that were undertaken within San Diego County, including the total dollar amount paid by the Contractor for each subcontract or supply contract.

4. The Contractor further agrees to fully cooperate in any investigation conducted by the City pursuant to the City's Nondiscrimination in Contracting Ordinance, Municipal Code §§22.3501 through 22.3517. The Contractor understands and agrees that violation of this clause shall be considered a material breach of the Contract and may result in remedies being ordered against the Contractor up to and including contract termination,

debarment and other sanctions for violation of the provisions of the Nondiscrimination in Contracting Ordinance. The Contractor further understands and agrees that the procedures, remedies and sanctions provided for in the Nondiscrimination in Contracting Ordinance apply only to violations of the Ordinance.

E. EQUAL EMPLOYMENT OPPORTUNITY OUTREACH PROGRAM.

1. The Contractor, Subcontractors and Suppliers shall comply with the City's Equal Employment Opportunity Outreach Program, San Diego Municipal Code §§22.2701 through 22.2707.

   The Contractor shall not discriminate against any employee or applicant for employment on any basis prohibited by law. Contractor shall provide equal opportunity in all employment practices. Prime Contractor shall ensure their subcontractors comply with this program. Nothing in this section shall be interpreted to hold a prime contractor liable for any discriminatory practice of its subcontractors.

   The Contractor shall include the foregoing clause in all contracts between the Contractor and Subcontractors and Suppliers.

2. If the Contract is competitively solicited, the selected Bidder shall submit a Work Force Report (Form BB05), within 10 Working Days after receipt by the Bidder of Contract forms to the City for approval as specified in the Notice of Intent to Award letter from the City.

3. If a Work Force Report is submitted, and the City determines there are under-representations when compared to County Labor Force Availability data, the selected Bidder shall submit an Equal Employment Opportunity Plan.

4. If the selected Bidder submits an Equal Employment Opportunity Plan, it shall include the following assurances:

   1. The Contractor shall maintain a working environment free of discrimination, harassment, intimidation and coercion at all sites and in all facilities at which the Contractor's employees are assigned to work.

   2. The Contractor reviews its EEO Policy, at least annually, with all on-site supervisors involved in employment decisions.

   3. The Contractor disseminates and reviews its EEO Policy with all employees at least once a year, posts the policy statement and EEO posters on all company bulletin boards and job sites, and documents every dissemination, review and posting with a written record to identify the time, place, employees present, subject matter, and disposition of meetings.

4. The Contractor reviews, at least annually, all supervisors' adherence to and performance under the EEO Policy and maintains written documentation of these reviews.

5. The Contractor discusses its EEO Policy Statement with subcontractors with whom it anticipates doing business, includes the EEO Policy Statement in its subcontracts, and provides such documentation to the City upon request.

6. The Contractor documents and maintains a record of all bid solicitations and outreach efforts to and from subcontractors, contractor associations and other business associations.

7. The Contractor disseminates its EEO Policy externally through various media, including the media of people of color and women, in advertisements to recruit, maintains files documenting these efforts, and provides copies of these advertisements to the City upon request.

8. The Contractor disseminates its EEO Policy to union and community organizations.

9. The Contractor provides immediate written notification to the City when any union referral process has impeded the Contractor's efforts to maintain its EEO Policy.

10. The Contractor maintains a current list of recruitment sources, including those outreaching to people of color and women, and provides written notification of employment opportunities to these recruitment sources with a record of the organizations' responses.

11. The Contractor maintains a current file of names, addresses and phone numbers of each walk-in applicant, including people of color and women, and referrals from unions, recruitment sources, or community organizations with a description of the employment action taken.

12. The Contractor encourages all present employees, including people of color and women employees, to recruit others.

13. The Contractor maintains all employment selection process information with records of all tests and other selection criteria.

14. The Contractor develops and maintains documentation for on-the-job training opportunities, participates in training programs, or both for all of its employees, including people of color and women, and establishes apprenticeship, trainee, and upgrade programs relevant to the Contractor's employment needs.

15. The Contractor conducts, at least annually, an inventory and evaluation of all employees for promotional opportunities and encourages all employees to seek and prepare appropriately for such opportunities.

16. The Contractor ensures the company's working environment and activities are non-segregated except for providing separate or single-user toilets and necessary changing facilities to assure privacy between the sexes.

ATTACHMENT D

SAFE DRINKING WATER STATE REVOLVING FUND (SDWSRF)

FUNDING AGENCY PROVISIONS

IN THE EVENT THAT THESE REQUIREMENTS CONFLICT WITH THE CITY'S GENERAL EOC REQUIREMENTS, THE FUNDING AGENCY'S REQUIREMENTS WILL CONTROL.

1. NOTICE OF REQUIREMENT FOR AFFIRMATIVE ACTION TO ENSURE EQUAL EMPLOYMENT OPPORTUNITY (EXECUTIVE ORDER 11246).

1.1. The goal and timetables for minority and female participation, expressed in percentage terms for the Contractor's aggregate workforce in each trade on all construction work in the covered area, as follows:

		Goal
1.	Minority Participation:	16.9%
2.	Female Participation:	6.9%

1.2. These goals are applicable to all the Contractor's construction work (whether or not it is Federal or federally assisted) performed in the covered area. If the Contractor performs Work in a geographical area located outside of the covered area, it shall apply the goals established for such geographical area where the Work is actually performed. With regard to this second area, the Contractor also is subject to the goals for both federally involved and non-federally involved Work.

1.3. The Contractor's compliance with the Executive Order and the regulations in 41 CFR Part 60-4 shall be based on its implementation of the Equal Opportunity Clause, specific affirmative action obligations required by the specifications set forth in 41 CFR 60-4.3(a), and its efforts to meet the goals.

1.4. The hours of minority and female employment and training shall be substantially uniform throughout the length of the Contract, and in each trade, and the Contractor shall make a good faith effort to employ minorities and women evenly on each of its projects. The transfer of minority or female employees or trainees from Contractor to Contractor or from project to project for the sole purpose of meeting the Contractor's goals shall be a violation of the Contract, the Executive Order, and the regulations in 41 CFR Part 60-4. Compliance with the goals will be measured against the total work hours performed.

1.5. The Contractor shall provide written notification to the Director the Office of Federal Contract Compliance Programs within 10 Working Days of award of any Subcontract in excess of $10,000 at any tier for Work under the Contract resulting from this solicitation. The notification shall list the name, address and telephone number of the Subcontractor; employer identification number of the Subcontractor; estimated dollar amount of the Subcontract; estimated starting and completion dates of the Subcontract; and the geographical area in which the subcontract is to be performed. The "covered area" is the City of San Diego.

2. EQUAL OPPORTUNITY CLAUSES:

2.1. The following equal opportunity clauses are incorporated by reference herein:

1. The equal opportunity clause located 41 CFR 60.1.4(a), which specifies the obligations imposed under Executive Order 11246.
2. The equal opportunity clause located at 41 CFR 60-741.5, which contains the obligations imposed by Section 503 of the Rehabilitation Act of 1973.
3. The "Equal Opportunity Clause" (Resolution No. 765092) filed on December 4, 1978, in the Office of the City Clerk, San Diego, California and incorporated in the "Standard Federal Employment Opportunity Construction Contract Specifications (Executive Order 11246 - Document No. 769023, filed September 11, 1984, in the Office of the City Clerk, San Diego, California) is applicable to all non-exempt City construction contracts and subcontracts of $2,000 or more.
4. Age Discrimination Act of 1975, Pub. L. 94-135.
5. Title VI of the Civil Rights Act of 1964, Pub. L. 88-352.
6. Section 13 of the Federal Water Pollution Control Acts Amendments of 1972, Pub. L. 92-5200 (the Clean Water Act).
7. Section 504 of the Rehabilitation Act of 1973, Pub. L. 93-112 (Executive Orders 11914 and 11250).
8. Women's Minority Business Enterprises, Executive Orders 11625, 12138 and 12432.
9. Section 129 of the Small Business Administration Reauthorization and Amendment Act of 1988, Pub. L. 100-590.

3. STANDARD FEDERAL EQUAL EMPLOYMENT SPECIFICATIONS:

3.1. The Contractor is required to comply with the 16 "Standard Federal Equal Employment Specifications" located at 41 CFR 60-4.3 for federal and federally-assisted construction contracts in excess of $10,000, set forth below.

3.2. The Contractor shall take specific affirmative actions to ensure equal employment opportunity. The evaluation of Contractor's compliance with these specifications shall be based upon its effort to achieve maximum results from its actions The Contractor shall document these efforts fully, and shall implement affirmative action steps at least as extensive as the following:

1. Ensure and maintain a working environment free of harassment, intimidation, and coercion at all sites, and in all facilities at which the Contractor's employees are assigned to work. The Contractor, where possible, will assign 2 or more women to each construction project. The Contractor shall specifically ensure that all foremen, superintendents, and other on-site supervisory personnel are aware of and carry out the Contractor's obligation to maintain such a working environment, with

specific attention to minority or female individuals working at such sites or in such facilities.

2. Establish and maintain a current list of minority and female recruitment sources, provide written notification to minority and female recruitment sources and to community organizations when the Contractor or its unions have employment opportunities available, and maintain a record of the organizations' responses.

3. Maintain a current file of the names, addresses and telephone numbers of each minority and female walk-in applicant and minority or female referral from a union, a recruitment source or community organization and of what action was taken with respect to each such individual. If such individual was sent to the union hiring hall for referral and was not referred back to the Contractor by the union or, if referred, not employed by the Contractor, this shall be documented in the file with the reason therefor, along with whatever additional actions the Contractor may have taken.

4. Provide immediate written notification to the Director when the union or unions with which the Contractor has a collective bargaining agreement has not referred to the Contractor a minority person or woman sent by the Contractor, or when the Contractor has other information that the union referral process has impeded the Contractor's efforts to meet its obligations.

5. Develop on-the-job training opportunities, participate in training programs for the area, or both which expressly include minorities and women, including upgrading programs and apprenticeship and trainee programs relevant to the Contractor's employment needs, especially those programs funded or approved by the Department of Labor. The Contractor shall provide notice of these programs to the sources compiled under item 2 of Section 3.2.

6. Disseminate the Contractor's EEO policy by providing notice of the policy to unions and training programs and requesting their cooperation in assisting the Contractor in meeting its EEO obligations; by including it in any policy manual and collective bargaining agreements; by publicizing it in the company newspaper, annual report, etc.; by specific review of the policy with all management personnel and with all minority and female employees at least once a year; and by posting the company EEO policy on bulletin boards accessible to all employees at each location where construction work is performed.

7. Review, at least annually, the company's EEO policy and affirmative action obligations under these specifications with all employees having any responsibility for hiring, assignments, layoff, termination or other employment decisions including specific review of these items with onsite supervisory personnel such as superintendents, foreman, etc., prior to the initiation of Work at any job site. A written record shall be made and

maintained identifying the time and place of these meetings, persons attending, subject matter discussed, and dispositions of the subject matter.

8. Disseminate the Contractor's EEO policy externally by including it in any advertising in the news media, specifically including minority and female news media, and providing written notification to and discussing the Contractor's EEO policy with other Contractors and Subcontractors with whom the Contractor does or anticipates doing business.

9. Direct its recruitment efforts, both oral and written, to minority, female and community organizations, to schools with minority and female students and to minority and female recruitment and training organizations serving the Contractor's recruitment area and employment needs. Not later than one month prior to the date for the acceptance of applications for apprenticeship or other training by any recruitment source, the Contractor shall send written notification to organizations such as the above, describing the openings, screening procedures, and tests to be used in the selection process.

10. Encourage present minority and female employees to recruit other minority persons and women and where reasonable, provide after school, summer and vacation employment to minority and female youth both on the site and in other areas of a Contractor's work force.

11. Validate all tests and other selection requirements where there is an obligation to do so under 41 CFR Part 60-3.

12. Conduct, at least annually, an inventory and evaluation at least of all minority and female personnel for promotional opportunities and encourage these employees to seek or to prepare for, through appropriate training, etc., such opportunities.

13. Ensure that seniority practices, job classifications, work assignments and other personnel practices do not have a discriminatory effect by continually monitoring all personnel and employment related activities to ensure that the EEO policy and the Contractor's obligations under these specifications are being carried out.

14. Ensure that all facilities and company activities are non-segregated except that separate or single-user toilet and necessary changing facilities shall be provided to assure privacy between the sexes.

15. Document and maintain a record of all solicitations of offers for subcontracts from minority and female construction contractors and suppliers, including circulation of solicitations to minority and female contractor associations and other business associations.

16. Conduct a review, at least annually, of all supervisors' adherence to and performance under the Contractor's EEO policies and affirmative action obligations.

4. VIOLATION OR BREACH OF REQUIREMENTS:

4.1. If at any time during the course of the Contract there is a violation of the Affirmative Action or Equal Employment Opportunity requirements by the Contractor, or the Subcontractors, the City will notify the Contractor of the breach. The City may withhold any further progress payments to the Contractor until the City is satisfied that the Contractor and Subcontractors are in full compliance with these requirements.

5. MONTHLY EMPLOYMENT UTILIZATION REPORTS:

5.1. Refer to GENERAL EQUAL OPPORTUNITY CONTRACTING PROGRAM REQUIREMENTS, CONSTRUCTION CONTRACTOR REQUIREMENTS in The WHITEBOOK and the following:

1. State of California Department of Transportation Payroll Report. Due to the City weekly.
2. Federal and Non-Federal Work in San Diego County. Submit an updated list only if work is complete or new contracts have been awarded during the span of this project.

6. RECORDS OF PAYMENTS TO DBEs:

6.1. The Contractor shall maintain records and documents of payments to DBEs for 5 years following the NOC. These records shall be made available for inspection upon request by any authorized representative of the City, funding agency, or both. The reporting requirement shall be extended to any certified DBE Subcontractor.

7. FEDERAL WAGE REQUIREMENTS FOR FEDERALLY FUNDED PROJECTS:

7.1. The successful Bidder's work shall be required to comply with Executive Order 11246, entitled "Equal Employment Opportunity,", as amended by Executive Order 11375, and as supplemented in Department of Labor regulations (41 CFR chapter 60).

7.2. This Executive Order pertains to Equal Employment Opportunity regulations and contains significant changes to the regulations including new goals and timetables for women in construction and revised goals and time-tables for minorities in construction.

7.3. Minimum wage rates for this project have been predetermined by the Secretary of Labor and are set forth in the Decision of the Secretary and bound into the specifications book. Should there be any difference between the state or federal wage rates, including health and welfare funds for any given craft, mechanic, or similar classifications needed to execute the Work, it shall be mandatory upon the Contractor or subcontractor to pay the higher of the two rates.

7.4. The minimum wage rate to be paid by the Contractor and the Subcontractors shall be in accordance with the Federal Labor Standards Provisions (see pages below) and Federal Wage Rates (see Wage Rates below) and General Prevailing Wage Determination made by the State of California, Director of Industrial Relations pursuant to California Labor Code Part 7, Chapter 1, Article 2, Sections 1770, 1773 and 1773.1, whichever is higher.

7.5. A Contractor having 50 or more employees and its Subcontractors having 50 or more employees and who may be awarded a contract of $50,000 or more will be required to maintain an affirmative action program, the standards for which are contained in the specifications.

7.6. To be eligible for award, each Bidder shall comply with the affirmative action requirements which are contained in the specifications.

7.7. Women will be afforded equal opportunity in all areas of employment. However, the employment of women shall not diminish the standards of requirements for the employment of minorities.

8. **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.

8.1. **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.

8.1.1. 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.

8.1.2. 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.

8.2. 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.

8.3. 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.

8.3.1. 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.

8.4. 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.

8.5. 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 sections1810 through 1815.

8.6. 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.

8.7. 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."

8.8. **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.

8.9. **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.

8.9.1. 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.

9. **WAGE RATES:** This contract shall be subject to the following Davis-Bacon Wage Decisions:

General Decision Number: CA160001 09/16/2016 CA1

Superseded General Decision Number: CA20150001

State: California

Construction Types: Building, Heavy (Heavy and Dredging), Highway and Residential

County: San Diego County in California.

BUILDING CONSTRUCTION PROJECTS; DREDGING PROJECTS (does not include hopper dredge work); HEAVY CONSTRUCTION PROJECTS (does not include water well drilling); HIGHWAY CONSTRUCTION PROJECTS; RESIDENTIAL CONSTRUCTION PROJECTS (consisting of single family homes and apartments up to and including 4 stories)

Note: Under Executive Order (EO) 13658, an hourly minimum wage of $10.15 for calendar year 2016 applies to all contracts subject to the Davis-Bacon Act for which the solicitation was issued on or after January 1, 2015. If this contract is covered by the EO, the contractor must pay all workers in any classification listed on this wage determination at least $10.15 (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract in calendar year 2016. The EO minimum wage rate will be adjusted annually. Additional information on contractor requirements and worker protections under the EO is available at www.dol.gov/whd/govcontracts.

Modification Number	Publication Date
0	01/08/2016
1	02/12/2016
2	02/19/2016
3	02/26/2016
4	03/04/2016
5	03/18/2016
6	07/01/2016
7	07/08/2016
8	07/22/2016
9	08/12/2016
10	08/26/2016
11	09/16/2016

Asbestos Workers/Insulator (Includes the application of all insulating materials, protective coverings, coatings, and finishes to all types of mechanical systems)	$ 36.74	19.49
Fire Stop Technician (Application of Firestopping Materials for wall openings		

and penetrations in walls, floors, ceilings and curtain walls)	$ 25.38	16.81

ASBE0005-004 06/29/2015

	Rates	Fringes
Asbestos Removal worker/hazardous material handler (Includes preparation, wetting, stripping, removal, scrapping, vacuuming, bagging and disposing of all insulation materials from mechanical systems, whether they contain asbestos or not)	$ 18.06	10.57

BOIL0092-003 10/01/2012

	Rates	Fringes
BOILERMAKER	$ 41.17	28.27

BRCA0004-008 11/01/2015

	Rates	Fringes
BRICKLAYER; MARBLE SETTER	$ 34.44	17.21

BRCA0018-004 06/01/2014

	Rates	Fringes
MARBLE FINISHER	$ 28.45	11.38
TILE FINISHER	$ 23.78	9.84
TILE LAYER	$ 35.14	14.33

BRCA0018-010 09/01/2013

	Rates	Fringes
TERRAZZO FINISHER	$ 26.59	10.34
TERRAZZO WORKER/SETTER	$ 33.63	11.13

CARP0409-002 07/01/2008

	Rates	Fringes
Diver		
(1) Wet	$ 663.68	9.82
(2) Standby	$ 331.84	9.82
(3) Tender	$ 323.84	9.82
(4) Assistant Tender	$ 299.84	9.82

Amounts in "Rates' column are per day

CARP0409-008 08/01/2010

	Rates	Fringes
Modular Furniture Installer	$ 17.00	7.41

CARP0547-001 07/01/2009

	Rates	Fringes
CARPENTER		
(1) Bridge	$ 37.28	10.58
(2) Commercial Building	$ 32.30	10.58
(3) Heavy & Highway	$ 37.15	10.58
(4) Residential Carpenter	$ 25.84	10.58
(5) Residential Insulation Installer	$ 18.00	8.16
MILLWRIGHT	$ 37.65	10.58
PILEDRIVERMAN	$ 37.28	10.58

CARP0547-002 07/01/2009

	Rates	Fringes
Drywall		
(1) Work on wood framed construction of single family residences, apartments or condominiums under four stories		
Drywall Installer/Lather	$ 21.00	8.58
Drywall Stocker/Scrapper	$ 11.00	6.67
(2) All other work		
Drywall Installer/Lather	$ 27.35	9.58
Drywall Stocker/Scrapper	$ 11.00	6.67

ELEC0569-001 08/31/2015

	Rates	Fringes
Electricians (Tunnel Work)		
Cable Splicer	$ 46.88	13.54
Electrician	$ 46.13	13.51
Electricians: (All Other Work, Including 4 Stories Residential)		
Cable Splicer	$ 41.75	13.38
Electrician	$ 41.00	13.36

ELEC0569-005 06/06/2016

	Rates	Fringes
Sound & Communications		
Sound Technician	$ 30.22	12.21

SOUND TECHNICIAN: Terminating, operating and performing final check-out

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ELEC0569-006 10/05/2015

Work on street lighting; traffic signals; and underground systems and/or established easements outside of buildings

	Rates	Fringes
Traffic signal, street light and underground work		
Utility Technician #1	$ 29.50	8.31
Utility Technician #2	$ 24.65	8.16

STREET LIGHT & TRAFFIC SIGNAL WORK:

UTILITY TECHNICIAN #1: Installation of street lights and traffic signals, including electrical circuitry, programmable controller, pedestal-mounted electrical meter enclosures and laying of pre-assembled cable in ducts. The layout of electrical systems and communication installation including proper position of trench depths, and radius at duct banks, location for manholes, street lights and traffic signals.

UTILITY TECHNICIAN #2: Distribution of material at jobsite, installation of underground ducts for electrical, telephone, cable TV land communication systems. The setting, leveling, grounding and racking of precast manholes, handholes and transformer pads.

ELEC0569-008 06/06/2016

	Rates	Fringes
ELECTRICIAN (Residential, 1-3 Stories)	$ 31.69	3%+6.61

ELEC1245-001 06/01/2015

	Rates	Fringes
LINE CONSTRUCTION		
(1) Lineman; Cable splicer	$ 52.85	15.53
(2) Equipment specialist (operates crawler tractors, commercial motor vehicles, backhoes, trenchers, cranes (50 tons and below), overhead & underground distribution line equipment)	$ 42.21	14.32
(3) Groundman	$ 32.28	14.03
(4) Powderman	$ 47.19	14.60

HOLIDAYS: New Year's Day, M.L. King Day, Memorial Day,

Independence Day, Labor Day, Veterans Day, Thanksgiving Day and day after Thanksgiving, Christmas Day

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ELEV0018-001 01/01/2015

	Rates	Fringes
ELEVATOR MECHANIC	$ 49.90	28.38

FOOTNOTE:
PAID VACATION: Employer contributes 8% of regular hourly rate as vacation pay credit for employees with more than 5 years of service, and 6% for 6 months to 5 years of service.
PAID HOLIDAYS: New Years Day, Memorial Day, Independence Day, Labor Day, Veterans Day, Thanksgiving Day, Friday after Thanksgiving, and Christmas Day.

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* ENGI0012-003 07/01/2016

	Rates	Fringes
OPERATOR: Power Equipment (All Other Work)		
GROUP 1	$ 39.95	23.35
GROUP 2	$ 40.73	23.35
GROUP 3	$ 41.02	23.35
GROUP 4	$ 42.51	23.35
GROUP 5	$ 41.86	23.35
GROUP 6	$ 41.83	23.35
GROUP 8	$ 42.84	23.35
GROUP 9	$ 42.19	23.35
GROUP 10	$ 42.96	23.35
GROUP 11	$ 42.31	23.35
GROUP 12	$ 43.13	23.35
GROUP 13	$ 43.23	23.35
GROUP 14	$ 43.26	23.35
GROUP 15	$ 43.34	23.35
GROUP 16	$ 43.46	23.35
GROUP 17	$ 43.63	23.35
GROUP 18	$ 43.73	23.35
GROUP 19	$ 43.84	23.35
GROUP 20	$ 43.96	23.35
GROUP 21	$ 44.13	23.35
GROUP 22	$ 44.23	23.35
GROUP 23	$ 44.34	23.35
GROUP 24	$ 44.46	23.35
GROUP 25	$ 44.63	23.35
OPERATOR: Power Equipment (Cranes, Piledriving & Hoisting)		
GROUP 1	$ 43.20	22.15
GROUP 2	$ 43.98	22.15
GROUP 3	$ 44.27	22.15
GROUP 4	$ 44.41	22.15
GROUP 5	$ 44.63	22.15
GROUP 6	$ 44.74	22.15

GROUP 7	$ 44.86	22.15
GROUP 8	$ 45.03	22.15
GROUP 9	$ 45.20	22.15
GROUP 10	$ 46.20	22.15
GROUP 11	$ 47.20	22.15
GROUP 12	$ 48.20	22.15
GROUP 13	$ 49.20	22.15

OPERATOR: Power Equipment
(Tunnel Work)

GROUP 1	$ 41.80	23.35
GROUP 2	$ 42.58	23.35
GROUP 3	$ 42.87	23.35
GROUP 4	$ 43.01	23.35
GROUP 5	$ 43.23	23.35
GROUP 6	$ 43.34	23.35
GROUP 7	$ 43.46	23.35

PREMIUM PAY:
$3.75 per hour shall be paid on all Power Equipment Operator work on the followng Military Bases: China Lake Naval Reserve, Vandenberg AFB, Point Arguello, Seely Naval Base, Fort Irwin, Nebo Annex Marine Base, Marine Corp Logistics Base Yermo, Edwards AFB, 29 Palms Marine Base and Camp Pendleton

Workers required to suit up and work in a hazardous material environment: $2.00 per hour additional. Combination mixer and compressor operator on gunite work shall be classified as a concrete mobile mixer operator.

SEE ZONE DEFINITIONS AFTER CLASSIFICATIONS

POWER EQUIPMENT OPERATORS CLASSIFICATIONS

GROUP 1: Bargeman; Brakeman; Compressor operator; Ditch Witch, with seat or similar type equipment; Elevator operator-inside; Engineer Oiler; Forklift operator (includes loed, lull or similar types under 5 tons; Generator operator; Generator, pump or compressor plant operator; Pump operator; Signalman; Switchman

GROUP 2: Asphalt-rubber plant operator (nurse tank operator); Concrete mixer operator-skip type; Conveyor operator; Fireman; Forklift operator (includes loed, lull or similar types over 5 tons; Hydrostatic pump operator; oiler crusher (asphalt or concrete plant); Petromat laydown machine; PJU side dum jack; Screening and conveyor machine operator (or similar types); Skiploader (wheel type up to 3/4 yd. without attachment); Tar pot fireman; Temporary heating plant operator; Trenching machine oiler

GROUP 3: Asphalt-rubber blend operator; Bobcat or similar type (Skid steer); Equipment greaser (rack); Ford Ferguson (with dragtype attachments); Helicopter radioman (ground); Stationary pipe wrapping and cleaning machine operator

GROUP 4: Asphalt plant fireman; Backhoe operator (mini-max or similar type); Boring machine operator; Boxman or mixerman

(asphalt or concrete); Chip spreading machine operator; Concrete cleaning decontamination machine operator; Concrete Pump Operator (small portable); Drilling machine operator, small auger types (Texoma super economatic or similar types - Hughes 100 or 200 or similar types - drilling depth of 30' maximum); Equipment greaser (grease truck); Guard rail post driver operator; Highline cableway signalman; Hydra-hammer-aero stomper; Micro Tunneling (above ground tunnel); Power concrete curing machine operator; Power concrete saw operator; Power-driven jumbo form setter operator; Power sweeper operator; Rock Wheel Saw/Trencher; Roller operator (compacting); Screed operator (asphalt or concrete); Trenching machine operator (up to 6 ft.); Vacuum or much truck

GROUP 5: Equipment Greaser (Grease Truck/Multi Shift).

GROUP 6: Articulating material hauler; Asphalt plant engineer; Batch plant operator; Bit sharpener; Concrete joint machine operator (canal and similar type); Concrete planer operator; Dandy digger; Deck engine operator; Derrickman (oilfield type); Drilling machine operator, bucket or auger types (Calweld 100 bucket or similar types - Watson 1000 auger or similar types - Texoma 330, 500 or 600 auger or similar types - drilling depth of 45' maximum); Drilling machine operator; Hydrographic seeder machine operator (straw, pulp or seed), Jackson track maintainer, or similar type; Kalamazoo Switch tamper, or similar type; Machine tool operator; Maginnis internal full slab vibrator, Mechanical berm, curb or gutter(concrete or asphalt); Mechanical finisher operator (concrete, Clary-Johnson-Bidwell or similar); Micro tunnel system (below ground); Pavement breaker operator (truck mounted); Road oil mixing machine operator; Roller operator (asphalt or finish), rubber-tired earth moving equipment (single engine, up to and including 25 yds. struck); Self-propelled tar pipelining machine operator; Skiploader operator (crawler and wheel type, over 3/4 yd. and up to and including 1-1/2 yds.); Slip form pump operator (power driven hydraulic lifting device for concrete forms); Tractor operator-bulldozer, tamper-scraper (single engine, up to 100 h.p. flywheel and similar types, up to and including D-5 and similar types); Tugger hoist operator (1 drum); Ultra high pressure waterjet cutting tool system operator; Vacuum blasting machine operator

GROUP 8: Asphalt or concrete spreading operator (tamping or finishing); Asphalt paving machine operator (Barber Greene or similar type); Asphalt-rubber distribution operator; Backhoe operator (up to and including 3/4 yd.), small ford, Case or similar; Cast-in-place pipe laying machine operator; Combination mixer and compressor operator (gunite work); Compactor operator (self-propelled); Concrete mixer operator (paving); Crushing plant operator; Drill Doctor; Drilling machine operator, Bucket or auger types (Calweld 150 bucket or similar types - Watson 1500, 2000 2500 auger or similar types - Texoma 700, 800 auger or similar types - drilling depth of 60' maximum); Elevating grader operator;

Grade checker; Gradall operator; Grouting machine operator; Heavy-duty repairman; Heavy equipment robotics operator; Kalamazoo balliste regulator or similar type; Kolman belt loader and similar type; Le Tourneau blob compactor or similar type; Loader operator (Athey, Euclid, Sierra and similar types); Mobark Chipper or similar; Ozzie padder or similar types; P.C. slot saw; Pneumatic concrete placing machine operator (Hackley-Presswell or similar type); Pumpcrete gun operator; Rock Drill or similar types; Rotary drill operator (excluding caisson type); Rubber-tired earth-moving equipment operator (single engine, caterpillar, Euclid, Athey Wagon and similar types with any and all attachments over 25 yds. up to and including 50 cu. yds. struck); Rubber-tired earth-moving equipment operator (multiple engine up to and including 25 yds. struck); Rubber-tired scraper operator (self-loading paddle wheel type-John Deere, 1040 and similar single unit); Self-propelled curb and gutter machine operator; Shuttle buggy; Skiploader operator (crawler and wheel type over 1-1/2 yds. up to and including 6-1/2 yds.); Soil remediation plant operator; Surface heaters and planer operator; Tractor compressor drill combination operator; Tractor operator (any type larger than D-5 - 100 flywheel h.p. and over, or similar-bulldozer, tamper, scraper and push tractor single engine); Tractor operator (boom attachments), Traveling pipe wrapping, cleaning and bendng machine operator; Trenching machine operator (over 6 ft. depth capacity, manufacturer's rating); trenching Machine with Road Miner attachment (over 6 ft depth capacity): Ultra high pressure waterjet cutting tool system mechanic; Water pull (compaction) operator

GROUP 9: Heavy Duty Repairman

GROUP 10: Drilling machine operator, Bucket or auger types (Calweld 200 B bucket or similar types-Watson 3000 or 5000 auger or similar types-Texoma 900 auger or similar types-drilling depth of 105' maximum); Dual drum mixer, dynamic compactor LDC350 (or similar types); Monorail locomotive operator (diesel, gas or electric); Motor patrol-blade operator (single engine); Multiple engine tractor operator (Euclid and similar type-except Quad 9 cat.); Rubber-tired earth-moving equipment operator (single engine, over 50 yds. struck); Pneumatic pipe ramming tool and similar types; Prestressed wrapping machine operator; Rubber-tired earth-moving equipment operator (single engine, over 50 yds. struck); Rubber tired earth moving equipment operator (multiple engine, Euclid, caterpillar and similar over 25 yds. and up to 50 yds. struck), Tower crane repairman; Tractor loader operator (crawler and wheel type over 6-1/2 yds.); Woods mixer operator (and similar Pugmill equipment)

GROUP 11: Heavy Duty Repairman - Welder Combination, Welder - Certified.

GROUP 12: Auto grader operator; Automatic slip form operator; Drilling machine operator, bucket or auger types (Calweld,

auger 200 CA or similar types - Watson, auger 6000 or similar types - Hughes Super Duty, auger 200 or similar types - drilling depth of 175' maximum); Hoe ram or similar with compressor; Mass excavator operator less tha 750 cu. yards; Mechanical finishing machine operator; Mobile form traveler operator; Motor patrol operator (multi-engine); Pipe mobile machine operator; Rubber-tired earth- moving equipment operator (multiple engine, Euclid, Caterpillar and similar type, over 50 cu. yds. struck); Rubber-tired self- loading scraper operator (paddle-wheel-auger type self-loading - two (2) or more units)

GROUP 13: Rubber-tired earth-moving equipment operator operating equipment with push-pull system (single engine, up to and including 25 yds. struck)

GROUP 14: Canal liner operator; Canal trimmer operator; Remote- control earth-moving equipment operator (operating a second piece of equipment: $1.00 per hour additional); Wheel excavator operator (over 750 cu. yds.)

GROUP 15: Rubber-tired earth-moving equipment operator, operating equipment with push-pull system (single engine, Caterpillar, Euclid, Athey Wagon and similar types with any and all attachments over 25 yds. and up to and including 50 yds. struck); Rubber-tired earth-moving equipment operator, operating equipment with push-pull system (multiple engine-up to and including 25 yds. struck)

GROUP 16: Rubber-tired earth-moving equipment operator, operating equipment with push-pull system (single engine, over 50 yds. struck); Rubber-tired earth-moving equipment operator, operating equipment with push-pull system (multiple engine, Euclid, Caterpillar and similar, over 25 yds. and up to 50 yds. struck)

GROUP 17: Rubber-tired earth-moving equipment operator, operating equipment with push-pull system (multiple engine, Euclid, Caterpillar and similar, over 50 cu. yds. struck); Tandem tractor operator (operating crawler type tractors in tandem - Quad 9 and similar type)

GROUP 18: Rubber-tired earth-moving equipment operator, operating in tandem (scrapers, belly dumps and similar types in any combination, excluding compaction units - single engine, up to and including 25 yds. struck)

GROUP 19: Rotex concrete belt operator (or similar types); Rubber-tired earth-moving equipment operator, operating in tandem (scrapers, belly dumps and similar types in any combination, excluding compaction units - single engine, Caterpillar, Euclid, Athey Wagon and similar types with any and all attachments over 25 yds.and up to and including 50 cu. yds. struck); Rubber-tired earth-moving equipment operator, operating in tandem (scrapers, belly dumps and similar types in any combination, excluding compaction units - multiple engine, up to and including 25 yds. struck)

GROUP 20: Rubber-tired earth-moving equipment operator, operating in tandem (scrapers, belly dumps and similar types in any combination, excluding compaction units - single engine, over 50 yds. struck); Rubber-tired earth-moving equipment operator, operating in tandem (scrapers, belly dumps, and similar types in any combination, excluding compaction units - multiple engine, Euclid, Caterpillar and similar, over 25 yds. and up to 50 yds. struck)

GROUP 21: Rubber-tired earth-moving equipment operator, operating in tandem (scrapers, belly dumps and similar types in any combination, excluding compaction units - multiple engine, Euclid, Caterpillar and similar type, over 50 cu. yds. struck)

GROUP 22: Rubber-tired earth-moving equipment operator, operating equipment with the tandem push-pull system (single engine, up to and including 25 yds. struck)

GROUP 23: Rubber-tired earth-moving equipment operator, operating equipment with the tandem push-pull system (single engine, Caterpillar, Euclid, Athey Wagon and similar types with any and all attachments over 25 yds. and up to and including 50 yds. struck); Rubber-tired earth-moving equipment operator, operating with the tandem push-pull system (multiple engine, up to and including 25 yds. struck)

GROUP 24: Rubber-tired earth-moving equipment operator, operating equipment with the tandem push-pull system (single engine, over 50 yds. struck); Rubber-tired earth-moving equipment operator, operating equipment with the tandem push-pull system (multiple engine, Euclid, Caterpillar and similar, over 25 yds. and up to 50 yds. struck)

GROUP 25: Concrete pump operator-truck mounted; Rubber-tired earth-moving equipment operator, operating equipment with the tandem push-pull system (multiple engine, Euclid, Caterpillar and similar type, over 50 cu. yds. struck)

CRANES, PILEDRIVING AND HOISTING EQUIPMENT CLASSIFICATIONS

GROUP 1: Engineer oiler; Fork lift operator (includes loed, lull or similar types)

GROUP 2: Truck crane oiler

GROUP 3: A-frame or winch truck operator; Ross carrier operator (jobsite)

GROUP 4: Bridge-type unloader and turntable operator; Helicopter hoist operator

GROUP 5: Hydraulic boom truck; Stinger crane (Austin-Western or similar type); Tugger hoist operator (1 drum)

GROUP 6: Bridge crane operator; Cretor crane operator; Hoist operator (Chicago boom and similar type); Lift mobile operator; Lift slab machine operator (Vagtborg and similar types); Material hoist and/or manlift operator; Polar gantry crane operator; Self Climbing scaffold (or similar type); Shovel, backhoe, dragline, clamshell operator (over 3/4 yd. and up to 5 cu. yds. mrc); Tugger hoist operator

GROUP 7: Pedestal crane operator; Shovel, backhoe, dragline, clamshell operator (over 5 cu. yds. mrc); Tower crane repair; Tugger hoist operator (3 drum)

GROUP 8: Crane operator (up to and including 25 ton capacity); Crawler transporter operator; Derrick barge operator (up to and including 25 ton capacity); Hoist operator, stiff legs, Guy derrick or similar type (up to and including 25 ton capacity); Shovel, backhoe, dragline, clamshell operator (over 7 cu. yds., M.R.C.)

GROUP 9: Crane operator (over 25 tons and up to and including 50 tons mrc); Derrick barge operator (over 25 tons up to and including 50 tons mrc); Highline cableway operator; Hoist operator, stiff legs, Guy derrick or similar type (over 25 tons up to and including 50 tons mrc); K-crane operator; Polar crane operator; Self erecting tower crane operator maximum lifting capacity ten tons

GROUP 10: Crane operator (over 50 tons and up to and including 100 tons mrc); Derrick barge operator (over 50 tons up to and including 100 tons mrc); Hoist operator, stiff legs, Guy derrick or similar type (over 50 tons up to and including 100 tons mrc), Mobile tower crane operator (over 50 tons, up to and including 100 tons M.R.C.); Tower crane operator and tower gantry

GROUP 11: Crane operator (over 100 tons and up to and including 200 tons mrc); Derrick barge operator (over 100 tons up to and including 200 tons mrc); Hoist operator, stiff legs, Guy derrick or similar type (over 100 tons up to and including 200 tons mrc); Mobile tower crane operator (over 100 tons up to and including 200 tons mrc)

GROUP 12: Crane operator (over 200 tons up to and including 300 tons mrc); Derrick barge operator (over 200 tons up to and including 300 tons mrc); Hoist operator, stiff legs, Guy derrick or similar type (over 200 tons, up to and including 300 tons mrc); Mobile tower crane operator (over 200 tons, up to and including 300 tons mrc)

GROUP 13: Crane operator (over 300 tons); Derrick barge operator (over 300 tons); Helicopter pilot; Hoist operator, stiff legs, Guy derrick or similar type (over 300 tons); Mobile tower crane operator (over 300 tons)

TUNNEL CLASSIFICATIONS

GROUP 1: Skiploader (wheel type up to 3/4 yd. without attachment)

GROUP 2: Power-driven jumbo form setter operator

GROUP 3: Dinkey locomotive or motorperson (up to and including 10 tons)

GROUP 4: Bit sharpener; Equipment greaser (grease truck); Slip form pump operator (power-driven hydraulic lifting device for concrete forms); Tugger hoist operator (1 drum); Tunnel locomotive operator (over 10 and up to and including 30 tons)

GROUP 5: Backhoe operator (up to and including 3/4 yd.); Small Ford, Case or similar; Drill doctor; Grouting machine operator; Heading shield operator; Heavy-duty repairperson; Loader operator (Athey, Euclid, Sierra and similar types); Mucking machine operator (1/4 yd., rubber-tired, rail or track type); Pneumatic concrete placing machine operator (Hackley-Presswell or similar type); Pneumatic heading shield (tunnel); Pumpcrete gun operator; Tractor compressor drill combination operator; Tugger hoist operator (2 drum); Tunnel locomotive operator (over 30 tons)

GROUP 6: Heavy Duty Repairman

GROUP 7: Tunnel mole boring machine operator

ENGINEERS ZONES

$1.00 additional per hour for all of IMPERIAL County and the portions of KERN, RIVERSIDE & SAN BERNARDINO Counties as defined below:

That area within the following Boundary: Begin in San Bernardino County, approximately 3 miles NE of the intersection of I-15 and the California State line at that point which is the NW corner of Section 1, T17N,m R14E, San Bernardino Meridian. Continue W in a straight line to that point which is the SW corner of the northwest quarter of Section 6, T27S, R42E, Mt. Diablo Meridian. Continue North to the intersection with the Inyo County Boundary at that point which is the NE corner of the western half of the northern quarter of Section 6, T25S, R42E, MDM. Continue W along the Inyo and San Bernardino County boundary until the intersection with Kern County, as that point which is the SE corner of Section 34, T24S, R40E, MDM. Continue W along the Inyo and Kern County boundary until the intersection with Tulare County, at that point which is the SW corner of the SE quarter of Section 32, T24S, R37E, MDM. Continue W along the Kern and Tulare County boundary, until that point which is the NW corner of T25S, R32E, MDM. Continue S following R32E lines to the NW corner of T31S, R32E, MDM. Continue W to the NW corner of T31S, R31E, MDM. Continue S to the SW corner of T32S, R31E, MDM. Continue W to SW corner of SE quarter of Section 34, T32S, R30E, MDM. Continue S to SW corner of T11N, R17W, SBM. Continue E along south boundary of T11N, SBM to SW corner of T11N, R7W, SBM. Continue S to SW corner of T9N, R7W, SBM. Continue E along south boundary of T9N, SBM to SW corner of T9N, R1E, SBM.

Continue S along west boundary of R1E, SMB to Riverside County line at the SW corner of T1S, R1E, SBM. Continue E along south boundary of T1s, SBM (Riverside County Line) to SW corner of T1S, R10E, SBM. Continue S along west boundary of R10E, SBM to Imperial County line at the SW corner of T8S, R10E, SBM. Continue W along Imperial and Riverside county line to NW corner of T9S, R9E, SBM. Continue S along the boundary between Imperial and San Diego Counties, along the west edge of R9E, SBM to the south boundary of Imperial County/California state line. Follow the California state line west to Arizona state line, then north to Nevada state line, then continuing NW back to start at the point which is the NW corner of Section 1, T17N, R14E, SBM

$1.00 additional per hour for portions of SAN LUIS OBISPO, KERN, SANTA BARBARA & VENTURA as defined below:

That area within the following Boundary: Begin approximately 5 miles north of the community of Cholame, on the Monterey County and San Luis Obispo County boundary at the NW corner of T25S, R16E, Mt. Diablo Meridian. Continue south along the west side of R16E to the SW corner of T30S, R16E, MDM. Continue E to SW corner of T30S, R17E, MDM. Continue S to SW corner of T31S, R17E, MDM. Continue E to SW corner of T31S, R18E, MDM. Continue S along West side of R18E, MDM as it crosses into San Bernardino Meridian numbering area and becomes R30W. Follow the west side of R30W, SBM to the SW corner of T9N, R30W, SBM. Continue E along the south edge of T9N, SBM to the Santa Barbara County and Ventura County boundary at that point whch is the SW corner of Section 34.T9N, R24W, SBM, continue S along the Ventura County line to that point which is the SW corner of the SE quarter of Section 32, T7N, R24W, SBM. Continue E along the south edge of T7N, SBM to the SE corner to T7N, R21W, SBM. Continue N along East side of R21W, SBM to Ventura County and Kern County boundary at the NE corner of T8N, R21W. Continue W along the Ventura County and Kern County boundary to the SE corner of T9N, R21W. Continue North along the East edge of R21W, SBM to the NE corner of T12N, R21W, SBM. Continue West along the north edge of T12N, SBM to the SE corner of T32S, R21E, MDM. [T12N SBM is a think strip between T11N SBM and T32S MDM]. Continue North along the East side of R21E, MDM to the Kings County and Kern County border at the NE corner of T25S, R21E, MDM, continue West along the Kings County and Kern County Boundary until the intersection of San Luis Obispo County. Continue west along the Kings County and San Luis Obispo County boundary until the intersection with Monterey County. Continue West along the Monterey County and San Luis Obispo County boundary to the beginning point at the NW corner of T25S, R16E, MDM.

$2.00 additional per hour for INYO and MONO Counties and the Northern portion of SAN BERNARDINO County as defined below:

That area within the following Boundary: Begin at the intersection of the northern boundary of Mono County and the California state line at the point which is the center of Section 17, T10N, R22E, Mt. Diablo Meridian. Continue S then

SE along the entire western boundary of Mono County, until it reaches Inyo County at the point which is the NE corner of the Western half of the NW quarter of Section 2, T8S, R29E, MDM. Continue SSE along the entire western boundary of Inyo County, until the intersection with Kern County at the point which is the SW corner of the SE 1/4 of Section 32, T24S, R37E, MDM. Continue E along the Inyo and Kern County boundary until the intersection with San Bernardino County at that point which is the SE corner of section 34, T24S, R40E, MDM. Continue E along the Inyo and San Bernardino County boundary until the point which is the NE corner of the Western half of the NW quarter of Section 6, T25S, R42E, MDM. Continue S to that point which is the SW corner of the NW quarter of Section 6, T27S, R42E, MDM. Continue E in a straight line to the California and Nevada state border at the point which is the NW corner of Section 1, T17N, R14E, San Bernardino Meridian. Then continue NW along the state line to the starting point, which is the center of Section 18, T10N, R22E, MDM.

REMAINING AREA NOT DEFINED ABOVE RECIEVES BASE RATE

ENGI0012-004 08/01/2015

	Rates	Fringes
OPERATOR: Power Equipment (DREDGING)		
(1) Leverman	$ 49.50	23.60
(2) Dredge dozer	$ 43.53	23.60
(3) Deckmate	$ 43.42	23.60
(4) Winch operator (stern winch on dredge)	$ 42.87	23.60
(5) Fireman-Oiler, Deckhand, Bargeman, Leveehand	$ 42.33	23.60
(6) Barge Mate	$ 42.94	23.60

IRON0377-002 07/01/2016

	Rates	Fringes
Ironworkers:		
Fence Erector	$ 28.33	20.64
Ornamental, Reinforcing and Structural	$ 34.75	29.20

PREMIUM PAY:

$6.00 additional per hour at the following locations:

China Lake Naval Test Station, Chocolate Mountains Naval Reserve-Niland,
Edwards AFB, Fort Irwin Military Station, Fort Irwin Training Center-Goldstone, San Clemente Island, San Nicholas Island, Susanville Federal Prison, 29 Palms - Marine Corps, U.S. Marine Base - Barstow, U.S. Naval Air Facility - Sealey, Vandenberg AFB

$4.00 additional per hour at the following locations:

Army Defense Language Institute - Monterey, Fallon Air Base, Naval Post Graduate School - Monterey, Yermo Marine Corps Logistics Center

$2.00 additional per hour at the following locations:

Port Hueneme, Port Mugu, U.S. Coast Guard Station - Two Rock

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* LABO0089-001 07/18/2016

	Rates	Fringes
LABORER (BUILDING and all other Residential Construction)		
Group 1	$ 29.42	19.78
Group 2	$ 30.10	19.78
Group 3	$ 30.81	19.78
Group 4	$ 31.61	19.78
Group 5	$ 33.54	19.78
LABORER (RESIDENTIAL CONSTRUCTION - See definition below)		
(1) Laborer	$ 27.32	18.11
(2) Cleanup, Landscape, Fencing (Chain Link & Wood)	$ 26.03	18.11

RESIDENTIAL DEFINITION: Wood or metal frame construction of single family residences, apartments and condominums - excluding (a) projects that exceed three stories over a garage level, (b) any utility work such as telephone, gas, water, sewer and other utilities and (c) any fine grading work, utility work or paving work in the future street and public right-of-way; but including all rough grading work at the job site behind the existing right of way

LABORER CLASSIFICATIONS

GROUP 1: Cleaning and handling of panel forms; Concrete Screeding for Rought Strike-off; Concrete, water curing; Demolition laborer; Flagman; Gas, oil and/or water pipeline laborer; General Laborer; General clean-up laborer; Landscape laborer; Jetting laborer; Temporary water and air lines laborer; Material hoseman (walls, slabs, floors and decks); Plugging, filling of Shee-bolt holes; Dry packing of concrete; Railroad maintenance, Repair Trackman and road beds, Streetcar and railroad construction trac laborers; Slip form raisers; Slurry seal crews (mixer operator, applicator operator, squeegee man, Shuttle man, top man), filling of cracks by any method on any surface; Tarman and mortar man; Tool crib or tool house laborer; Window cleaner; Wire Mesh puling-all concrete pouring operations

GROUP 2: Asphalt Shoveler; Cement Dumper (on 1 yard or larger mixer and handling bulk cement); Cesspool digger and installer; Chucktender; Chute man, pouring concrete, the handling of the cute from ready mix trucks, such as walls, slabs, decks, floors, foundations, footings, curbs, gutters and sidewalks; Concrete curer-impervious membrane and form oiler; Cutting torch operator (demoliton); Guinea chaser; Headboard man-asphlt; Laborer,
packing rod steel and pans; membrane vapor barrier installer; Power broom sweepers (small); Riiprap, stonepaver, placing stone or wet sacked concrete; Roto scraper and tiller; Tank sealer and cleaner; Tree climber, faller, chain saw operator, Pittsburgh Chipper and similar type brush shredders; Underground laborers, including caisson bellower

GROUP 3: Buggymobile; Concrete cutting torch; Concrete cutting torch; Concrete pile cutter; Driller, jackhammer, 2 1/2 feet drill steel or longer; Dri Pak-it machine; High sealer (including drilling of same); Hydro seeder and similar type; Impact wrench, mult-plate; Kettlemen, potmen and mean applying asphalt, lay-kold, creosote, line caustic and similar type materials (applying means applying, dipping, brushing or handling of such materials for pipe wrapping and waterproofing); Operators of pneumatic, gas, electric tools, vibratring machines, pavement breakers, air blasting, come-along, and similar mechanical tools not separately classified herein; Pipelayers back up man coating, grouting, making of joints, sealing, caulking, diapering and incldуing rubber gasket joints, pointing and any and all other services; Rotary Scarifier or multiple head concrete chipping scaarifier; Steel header board man and guideline setter; Tampers, Barko, Wacker and similar type; Trenching machine, handpropelled

GROUP 4: Asphalt raker, luterman, ironer, apshalt dumpman and asphalt spreader boxes (all types); Concrete core cutter (walls, floors or ceilings), Grinder or sander; Concrete saw man; cutting walls or flat work, scoring old or new concrete; Cribber, shorer, lagging, sheeting and trench bracing, hand-guided lagging hammer; Laser beam in connection with laborer's work; Oversize concrete vibrator operator 70 pounds and over; Pipelayer performing all services in the laying, installation and all forms of connection of pipe from the point of receiving pipe in the ditch until completion of oepration, including any and all forms of tubular material, whether pipe, metallic or non-metallic, conduit, and any other stationary type of tubular device used for the conveying of any substance or element, whether water, sewage, solid, gas, air or other product whatsoever and without regard to the nature of material from which the tubular material is fabricated; No joint pipe and stripping of same; Prefabricated manhole installer; Sandblaster (nozzleman), Porta shot-blast, water blasting

GROUP 5: Blasters Powderman-All work of loading holes, placing and blasting of all pwder and explosives of

whatever type, regardless of method used for such loading and placing; Driller-all power drills, excluding jackhammer, whether core, diamond, wagon, track, multiple unit, and any and all other types of mechanical drills without regard to the form of motive power.

LABO0089-002 11/01/2015

	Rates	Fringes
LABORER (MASON TENDER).....	$ 29.12	15.39

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* LABO0089-004 07/03/2016

HEAVY AND HIGHWAY CONSTRUCTION

	Rates	Fringes
Laborers:		
Group 1.....	$ 30.54	19.73
Group 2.....	$ 31.00	19.73
Group 3.....	$ 31.41	19.73
Group 4.....	$ 32.25	19.73
Group 5.....	$ 36.37	19.73

LABORER CLASSIFICATIONS

GROUP 1: Laborer: General or Construction Laborer, Landscape Laborer. Asphalt Rubber Material Loader. Boring Machine Tender (outside), Carpenter Laborer (cleaning, handling, oiling & blowing of panel forms and lumber), Concrete Laborer, Concrete Screeding for rough strike-off, Concrete water curing. Concrete Curb & Gutter laborer, Certified Confined Space Laborer, Demolition laborer & Cleaning of Brick and lumber,Expansion Joint Caulking; Environmental Remediation, Monitoring Well, Toxic waste and Geotechnical Drill tender, Fine Grader, Fire Watcher, Limbers, Brush Loader, Pilers and Debris Handlers. flagman. Gas Oil and Water Pipeline Laborer. Material Hoseman (slabs, walls, floors, decks); Plugging, filling of shee bolt holes; Dry packing of concrete and patching; Post Holer Digger (manual); Railroad maintenance, repair trackman, road beds; Rigging & signaling; Scaler, Slip-Form Raisers, Filling cracks on any surface, tool Crib or Tool House Laborer, Traffic control (signs, barriers, barricades, delineator, cones etc.), Window Cleaner

GROUP 2: Asphalt abatement; Buggymobile; Cement dumper (on 1 yd. or larger mixers and handling bulk cement); Concrete curer, impervious membrane and form oiler; Chute man, pouring concrete; Concrete cutting torch; Concrete pile cutter; driller/Jackhammer, with drill steel 2 1/'2 feet or longer; Dry pak-it machine; Fence erector; Pipeline wrapper, gas, oil, water, pot tender & form man; Grout man; Installation of all asphalt overlay fabric and materials used for reinforcing asphalt; Irrigation laborer; Kettleman-Potman hot mop, includes applying asphalt,

lay-klold, creosote, lime caustic and similar tyhpes of materials (dipping, brushing, handling) and waterproofing; Membrane vapor barrier installer; Pipelayer backup man (coating, grouting, making of joints, sealing caulkiing, diapering including rubber basket joints, pointing); Rotary scarifier, multiple head concrete chipper; Rock slinger; Roto scraper & tiller; Sandblaster pot tender; Septic tank digger/installer; Tamper/wacker operator; Tank scaler & cleaner; Tar man & mortar man; Tree climber/faller, chainb saw operator, Pittsburgh chipper & similar type brush shredders.

GROUP 3: Asphalt, installation of all frabrics; Buggy Mobile Man, Bushing hammer; Compactor (all types), Concrete Curer - Impervious membrane, Form Oiler, Concrete Cutting Torch, Concrete Pile Cutter,Driller/Jackhammer with drill steel 2 1/2 ft or longer, Dry Pak-it machine, Fence erector including manual post hole digging, Gas oil or water Pipeline Wrapper - 6 ft pipe and over, Guradrail erector, Hydro seeder, Impact Wrench man (multi plate), kettleman-Potman Hot Mop includes applying Asphalt, Lay-Kold, Creosote, lime caustic and similar types of materials (dipping, brushing or handling) and waterproofing. Laser Beam in connection with Laborer work. High Scaler, Operators of Pneumatic Gas or Electric Tools, Vibrating Machines, Pavement Breakers, Air Blasting, Come-Alongs and similar mechanical tools, Remote-Controlled Robotic Tools in connection with Laborers work. Pipelayer Backup Man (Coating, grouting,m makeing of joints, sealing, caulking, diapering including rubber gasket joints, pointing and other services). Power Post Hole Digger, Rotary Scarifier (multiple head concrete chipper scarifier), Rock Slinger, Shot Blast equipment (8 to 48 inches), Steel Headerboard Man and Guideline Setter, Tamper/Wacker operator and similar types, Trenching Machine hand propelled.

GROUP 4: Any worker exposed to raw sewage. Asphalt Raker, Luteman, Asphalt Dumpman, Asphalt Spreader Boxes, Concrete Core Cutter, Concrete Saw Man, Cribber, Shorer, Head Rock Slinger. Installation of subsurface instrumentation, monitoring wells or points, remediation system installer; Laborer, asphalt-rubber distributor bootman; Oversize concrete vibrator operators, 70 pounds or over. Pipelayer, Prfefabricated Manhole Installer, Sandblast Nozzleman (Water Balsting-Porta Shot Blast), Traffic Lane Closure.

GROUP 5: Blasters Powderman-All work of loading holes, placing and blasting of all powder and explosives of whatever type, regardless of method used for such loading and placing; Horizontal directional driller, Boring system, Electronic traking, Driller: all power drills excluding jackhammer, whether core, diamond, wagon, track, multiple unit, and all other types of mechanical drills without regard to form of motive power. Environmental remediation, Monitoring well, Toxic waste and Geotechnical driller, Toxic waste removal. Welding in connection with Laborer's work.

LABO0300-005 01/01/2016

	Rates	Fringes
Asbestos Removal Laborer	$ 30.43	16.07

SCOPE OF WORK: Includes site mobilization, initial site cleanup, site preparation, removal of asbestos-containing material and toxic waste, encapsulation, enclosure and disposal of asbestos- containing materials and toxic waste by hand or with equipment or machinery; scaffolding, fabrication of temporary wooden barriers and assembly of decontamination stations.

LABO1184-001 07/04/2016

	Rates	Fringes
Laborers: (HORIZONTAL DIRECTIONAL DRILLING)		
(1) Drilling Crew Laborer	$ 33.65	13.95
(2) Vehicle Operator/Hauler	$ 33.82	13.95
(3) Horizontal Directional Drill Operator	$ 35.67	13.95
(4) Electronic Tracking Locator	$ 37.67	13.95
Laborers: (STRIPING/SLURRY SEAL)		
GROUP 1	$ 34.86	17.03
GROUP 2	$ 36.16	17.03
GROUP 3	$ 38.17	17.03
GROUP 4	$ 39.91	17.03

LABORERS - STRIPING CLASSIFICATIONS

GROUP 1: Protective coating, pavement sealing, including repair and filling of cracks by any method on any surface in parking lots, game courts and playgrounds; carstops; operation of all related machinery and equipment; equipment repair technician

GROUP 2: Traffic surface abrasive blaster; pot tender - removal of all traffic lines and markings by any method (sandblasting, waterblasting, grinding, etc.) and preparation of surface for coatings. Traffic control person: controlling and directing traffic through both conventional and moving lane closures; operation of all related machinery and equipment

GROUP 3: Traffic delineating device applicator: Layout and application of pavement markers, delineating signs, rumble and traffic bars, adhesives, guide markers, other traffic delineating devices including traffic control. This category includes all traffic related surface preparation (sandblasting, waterblasting, grinding) as part of the

application process. Traffic protective delineating system installer: removes, relocates, installs, permanently affixed roadside and parking delineation barricades, fencing, cable anchor, guard rail, reference signs, monument markers; operation of all related machinery and equipment; power broom sweeper

GROUP 4: Striper: layout and application of traffic stripes and markings; hot thermo plastic; tape traffic stripes and markings, including traffic control; operation of all related machinery and equipment

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* LABO1414-003 08/03/2016

	Rates	Fringes
LABORER		
PLASTER CLEAN-UP LABORER	$ 31.60	19.28
PLASTER TENDER	$ 34.15	19.28

Work on a swing stage scaffold: $1.00 per hour additional.

Work at Military Bases - $3.00 additional per hour:
Coronado Naval Amphibious Base, Fort Irwin, Marine Corps Air Station-29 Palms, Imperial Beach Naval Air Station, Marine Corps Logistics Supply Base, Marine Corps Pickle Meadows, Mountain Warfare Training Center, Naval Air Facility-Seeley, North Island Naval Air Station, Vandenberg AFB.

PAIN0036-001 07/01/2015

	Rates	Fringes
Painters: (Including Lead Abatement)		
(1) Repaint (excludes San Diego County)	$ 27.29	12.83
(2) All Other Work	$ 30.72	12.83

REPAINT of any previously painted structure. Exceptions: work involving the aerospace industry, breweries, commercial recreational facilities, hotels which operate commercial establishments as part of hotel service, and sports facilities.

PAIN0036-010 10/01/2015

	Rates	Fringes
DRYWALL FINISHER/TAPER		
(1) Building & Heavy Construction	$ 27.84	15.20
(2) Residential Construction (Wood frame		

apartments, single family
homes and multi-duplexes
up to and including four
stories).....$ 21.00 13.91

PAIN0036-012 10/01/2015

	Rates	Fringes
GLAZIER	$ 40.80	17.66

PAIN0036-019 01/01/2016

	Rates	Fringes
SOFT FLOOR LAYER	$ 26.77	13.53

PLAS0200-005 08/06/2015

	Rates	Fringes
PLASTERER	$ 38.44	13.77

NORTH ISLAND NAVAL AIR STATION, COLORADO NAVAL AMPHIBIOUS BASE, IMPERIAL BEACH NAVAL AIR STATION: $3.00 additional per hour.

PLAS0500-001 07/01/2016

	Rates	Fringes
CEMENT MASON/CONCRETE FINISHER		
GROUP 1	$ 23.84	22.85
GROUP 2	$ 25.49	22.85
GROUP 3	$ 27.57	22.85

CEMENT MASONS - work inside the building line, meeting the following criteria:

GROUP 1: Residential wood frame project of any size; work classified as Type III, IV or Type V construction; interior tenant improvement work regardless the size of the project; any wood frame project of four stories or less.

GROUP 2: Work classified as type I and II construction

GROUP 3: All other work

PLUM0016-006 07/01/2016

	Rates	Fringes
PLUMBER, PIPEFITTER, STEAMFITTER		
Camp Pendleton	$ 51.69	21.41
Plumber and Pipefitter		

All other work except work on new additions and remodeling of bars, restaurant, stores and commercial buildings not to exceed 5,000 sq. ft. of floor space and work on strip malls, light commercial, tenant improvement and remodel work	$ 47.19	21.41
Work ONLY on new additions and remodeling of commercial buildings, bars, restaurants, and stores not to exceed 5,000 sq. ft. of floor space	$ 45.73	20.43
Work ONLY on strip malls, light commercial, tenant improvement and remodel work	$ 35.69	18.76

PLUM0016-011 07/01/2016

	Rates	Fringes
PLUMBER/PIPEFITTER		
Residential	$ 38.17	17.33

PLUM0345-001 07/01/2014

	Rates	Fringes
PLUMBER		
Landscape/Irrigation Fitter	$ 29.27	19.75
Sewer & Storm Drain Work	$ 33.24	17.13

ROOF0045-001 07/01/2012

	Rates	Fringes
ROOFER	$ 25.08	7.28

SFCA0669-001 04/01/2016

	Rates	Fringes
SPRINKLER FITTER	$ 37.67	19.56

SHEE0206-001 07/01/2015

	Rates	Fringes
SHEET METAL WORKER		
Camp Pendleton	$ 37.55	23.23
Except Camp Pendleton	$ 35.33	23.23
Sheet Metal Technician	$ 25.22	6.69

SHEET METAL TECHNICIAN - SCOPE:
a. Existing residential buildings, both single and multi-family, where each unit is heated and/or cooled by a separate system b. New single family residential buildings including tracts. c. New multi-family residential buildings, not exceeding five stories of living space in height, provided each unit is heated or cooled by a separate system. Hotels and motels are excluded. d. LIGHT COMMERCIAL WORK: Any sheet metal, heating and air conditioning work performed on a project where the total construction cost, excluding land, is under $1,000,000 e. TENANT IMPROVEMENT WORK: Any work necessary to finish interior spaces to conform to the occupants of commercial buildings, after completion of the building shell

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TEAM0036-001 07/06/2015

	Rates	Fringes
Truck drivers:		
GROUP 1	$ 15.40	28.69
GROUP 2	$ 24.99	28.69
GROUP 3	$ 25.19	28.69
GROUP 4	$ 25.39	28.69
GROUP 5	$ 25.59	28.69
GROUP 6	$ 26.09	28.69
GROUP 7	$ 27.59	28.69

FOOTNOTE: HAZMAT PAY: Work on a hazmat job, where hazmat certification is required, shall be paid, in addition to the classification working in, as follows: Levels A, B and C - +$1.00 per hour. Workers shall be paid hazmat pay in increments of four (4) and eight (8) hours.

TRUCK DRIVER CLASSIFICATIONS

GROUP 1: Fuel Man, Swamper

GROUP 2: 2-axle Dump Truck, 2-axle Flat Bed,Concrete Pumping Truck, Industrial Lift Truck, Motorized Traffic Control, Pickup Truck on Jobsite

GROUP 3: 2-axle Water Truck, 3-axle Dump Truck, 3-axle Flat Bed, Erosion Control Nozzleman, Dump Crete Truck under 6.5 yd, Forklift 15,000 lbs and over, Prell Truck, Pipeline Work Truck Driver, Road Oil Spreader, Cement Distributor or Slurry Driver, Bootman, Ross Carrier

GROUP 4: Off-road Dump Truck under 35 tons 4-axles but less than 7-axles, Low-Bed Truck & Trailer, Transit Mix Trucks under 8 yd, 3-axle Water Truck, Erosion Control Driver, Grout Mixer Truck, Dump Crete 6.5yd and over, Dumpster Trucks, DW 10, DW 20 and over, Fuel Truck and Dynamite, Truck Greaser, Truck Mounted Mobile Sweeper 2-axle Winch Truck

GROUP 5: Off-road Dump Truck 35 tons and over, 7-axles or more, Transit Mix Trucks 8 yd and over, A-Frame Truck, Swedish Cranes

GROUP 6: Off-Road Special Equipment (including but not limited to Water Pull Tankers, Athey Wagons, DJB, B70 Wuclids or like Equipment)

GROUP 7: Repairman

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

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Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (ii)).

The body of each wage determination lists the classification and wage rates that have been found to be prevailing for the cited type(s) of construction in the area covered by the wage determination. The classifications are listed in alphabetical order of "identifiers" that indicate whether the particular rate is a union rate (current union negotiated rate for local), a survey rate (weighted average rate) or a union average rate (weighted union average rate).

Union Rate Identifiers

A four letter classification abbreviation identifier enclosed in dotted lines beginning with characters other than "SU" or "UAVG" denotes that the union classification and rate were prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2014. PLUM is an abbreviation identifier of the union which prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. 07/01/2014 is the effective date of the most current negotiated rate, which in this example is July 1, 2014.

Union prevailing wage rates are updated to reflect all rate changes in the collective bargaining agreement (CBA) governing this classification and rate.

Survey Rate Identifiers

Classifications listed under the "SU" identifier indicate that no one rate prevailed for this classification in the survey and the published rate is derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As this weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SULA2012-007 5/13/2014. SU indicates the rates are survey rates based on a weighted average calculation of rates and are not majority rates. LA indicates the State of Louisiana. 2012 is the year of survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. 5/13/2014 indicates the survey completion date for the classifications and rates under that identifier.

Survey wage rates are not updated and remain in effect until a new survey is conducted.

Union Average Rate Identifiers

Classification(s) listed under the UAVG identifier indicate that no single majority rate prevailed for those classifications; however, 100% of the data reported for the classifications was union data. EXAMPLE: UAVG-OH-0010 08/29/2014. UAVG indicates that the rate is a weighted union average rate. OH indicates the state. The next number, 0010 in the example, is an internal number used in producing the wage determination. 08/29/2014 indicates the survey completion date for the classifications and rates under that identifier.

A UAVG rate will be updated once a year, usually in January of each year, to reflect a weighted average of the current negotiated/CBA rate of the union locals from which the rate is based.

WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can be:

* an existing published wage determination
* a survey underlying a wage determination
* a Wage and Hour Division letter setting forth a position on a wage determination matter
* a conformance (additional classification and rate) ruling

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour Regional Office for the area in which the survey was conducted because those Regional Offices have responsibility for the Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:

Branch of Construction Wage Determinations
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

2.) If the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

Wage and Hour Administrator
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3.) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

4.) All decisions by the Administrative Review Board are final.

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END OF GENERAL DECISION

10. FEDERAL LABOR STANDARDS PROVISIONS (Office of the Secretary of Labor 29 CFR 5):

Applicability

The Project or Program to which the construction work covered by this contract pertains is being assisted by the United States of America and the following Federal Labor Standards Provisions are included in this Contract pursuant to the provisions applicable to such Federal assistance.

A. 1. Minimum Wages. (i) All laborers and mechanics employed or working upon the site of the work, (or under the United States Housing Act of 1937 or under the Housing Act of 1949 in the construction or development of the project) will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations issued by the Secretary of Labor under the Copeland Act (29 CFR Part 3), the full amount of wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the contractor and such laborers and mechanics.

Contributions made or costs reasonably anticipated for bona fide fringe benefits under Section l(b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of 29 CFR 5.5(a)(1)(iv); also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs, which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period. Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in 29 CFR 5.5(a)(4). Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein: Provided that the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classification and wage rates conformed under 29 CFR 5.5(a)(1)(ii) and the Davis-Bacon poster (WH-1321) shall be posted at all times by the contractor and its subcontractors at the site of the work in a prominent and accessible, place where it can be easily seen by the workers.

(ii) (A) Any class of laborers or mechanics, including helpers, which is not listed in the wage determination and which is to be employed under the contract shall be classified in conformance with the wage determination. The Federal Agency or its designee shall approve an additional classification and wage rate and fringe benefits therefore only when the following criteria have been met:

(1) The work to be performed by the classification requested is not performed by a classification in the wage determination; and

(2) The classification is utilized in the area by the construction industry; and

(3) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.

(B) If the contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and the contracting officer or its designee agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken shall be sent by the contracting officer to the Administrator of the Wage and Hour Division, Employment Standards Administration, U.S. Department of Labor, Washington, D.C. 20210. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

(C) In the event the contractor, the laborers or mechanics to be employed in the classification or their representatives, and the contracting officer do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), the contracting officer shall refer the questions, including the views of all interested parties and the recommendation of the contracting officer, to the Administrator for determination. The Administrator, or an authorized representative, will issue a determination within 30 days of receipt and so advise contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

(D) The wage rate (including fringe benefits where appropriate) determined pursuant to subparagraphs (1)(ii)(b) or (c) of this section, shall be paid to all workers performing work in the classification under this contract from the first day on which work is performed in the classification.

(iii) Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the contractor shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly cash equivalent thereof.

(iv) If the contractor does not make payments to a trustee or other third person, the contractor may consider as part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program, Provided, That the Secretary of Labor has found, upon the written request of the contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the contractor to set aside in a separate account assets for the meeting of obligations under the plan or program.

2. Withholding. The Federal Agency or its designee shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld from the contractor under this contract or any other Federal contract with the same prime contractor, or any other Federally-assisted contract subject to Davis-Bacon prevailing wage requirements, which is held by the same prime contractor so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees and helpers, employed by the contractor or any subcontractor the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee or helper, employed or working on the site of the work (or under the United States Housing Act of 1937 or under the Housing Act of 1949 in the construction or development of the project), all or part of the wages required by the contract, the Federal Agency or its designee may, after written notice to the contractor, sponsor, applicant, or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased.

3. Payrolls and basic records. (i) Payrolls and basic records relating thereto shall be maintained by the contractor during the course of the work preserved for a period of 3 years thereafter for all laborers

and mechanics working at the site of the work (or under the United States Housing Act of 1937 or under the Housing Act of 1949 in the construction or development of the project. Such records shall contain the name, address, and social security number of each such worker, his or her correct classification, hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in Section l(b)(2)(B) of the Davis-bacon Act), daily and weekly number of hours worked, deductions made and actual wages paid. Whenever the Secretary of Labor has found under 29 CFR 5.5 (a)(1)(iv) that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in Section l(b)(2)(B) of the Davis-Bacon Act, the contractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual cost incurred in providing such benefits. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs.

(ii) (A) The contractor shall submit weekly for each week in which any contract work is performed a copy of all payrolls to the Federal Agency or its designee if the agency is a party to the contract, but if the agency is not such a party, the contractor will submit the payrolls to the applicant sponsor, or owner, as the case may be, for transmission to the Federal Agency or its designee. The payrolls submitted shall set out accurately and completely all of the information required to be maintained under 29 CFR 5.5(a)(3)(i) except that full social security numbers and home addresses shall not be included on weekly transmittals. Instead the payrolls shall only need to include an individually identifying number for each employee (e.g., the last four digits of the employee's social security number). The required weekly payroll information may be submitted in any form desired.

Optional Form WH-347 is available for this purpose from the Wage and Hour Division Web site at

https://www.dol.gov/whd/forms/wh347.pdf

or its successor site. The prime contractor is responsible for the submission of copies of payrolls by all subcontractors. Contractors and subcontractors shall maintain the full social security number and current address of each covered worker, and shall provide them upon request to the Federal Agency or its designee if the agency is a party to the contract, but if the agency is not such a party, the contractor will submit the payrolls to the applicant sponsor, or owner, as the case may be, for transmission to the Federal Agency , the contractor, or the Wage and Hour Division of the Department of Labor for purposes of an investigation or audit of compliance with prevailing wage requirements. It is not a violation of this subparagraph for a prime contractor to require a subcontractor to provide addresses and social security numbers to the prime contractor for its own records, without weekly submission to the sponsoring government agency (or the applicant, sponsor, or, owner).

(B) Each payroll submitted shall be accompanied by a "Statement of Compliance," signed by the contractor or subcontractor or his or her agent who pays or supervises the payment of the persons employed under the contract and shall certify the following:

(1) That the payroll for the payroll period contains the information required to be provided under 29 CFR 5.5 (a)(3)(ii), the appropriate information is being maintained under 29 CFR 5.5(a)(3)(i), and that such information is correct and complete;

(2) That each laborer or mechanic (including each helper, apprentice, and trainee) employed on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in 29 CFR Part 3;

(3) That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification of work performed, as specified in the applicable wage determination incorporated into the contract.

(C) The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirement for submission of the "Statement of Compliance" required by subparagraph A.3.(ii)(b)of this section.

(D) The falsification of any of the above certifications may subject the contractor or subcontractor to civil or criminal prosecution under Section 1001 of Title 18 and Section 231 of Title 31 of the United States Code.

(iii) The contractor or subcontractor shall make the records required under subparagraph A.3.(i) of this section available for inspection, copying, or transcription by authorized representatives of the Federal Agency or its designee or the Department of Labor, and shall permit such representatives to interview employees during working hours on the job. If the contractor or subcontractor fails to submit the required records or to make them available, Federal agency or its designee may, after written notice to the contractor, sponsor, applicant or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR 5.12.

4. Apprentices and Trainees. (i) Apprentices. Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Office of Apprenticeship Training, Employer and Labor Services, or with a State Apprenticeship Agency recognized by the Office, or if a person is employed in his or her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Office of Apprenticeship Training, Employer and Labor Services or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice. The allowable ratio of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated above, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a contractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman's hourly rate) specified in the contractor's or subcontractor's registered program shall be observed. Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeymen hourly rate specified in the applicable wage determination.

Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination. In the event the Office of Apprenticeship Training, Employer and Labor Services, or a State Apprenticeship Agency recognized by the Office, withdraws approval of an apprenticeship program, the contractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(ii) Trainees. Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration. The ratio of trainees to journeymen on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration. Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate on the wage determination which provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. In the event the Employment and Training Administration withdraws approval of a training program, the contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(iii) Equal employment opportunity. The utilization of apprentices, trainees and journeymen under 29 CFR Part 5 shall be in conformity with the equal employment opportunity requirements of Executive Order 11246, as amended, and 29 CFR Part 30.

5. Compliance with Copeland Act requirements. The contractor shall comply with the requirements of 29 CFR Part 3 which are incorporated by reference in this contract

6. Subcontracts. The contractor or subcontractor will insert in any subcontracts the clauses contained in 29 CFR 5.59(a)(1) through (10 and such other clauses as the Federal Agency may by appropriate instructions require, and a copy of the applicable prevailing wage decision, and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all the contract clauses in 29 CFR 5.5.

7. Contract termination; debarment. A breach of the contract clauses in 29 CFR 5.5 may be grounds for termination of the contract and for debarment as a contractor and a subcontractor as provided in 29 CFR 5.12.

8. Compliance with Davis-Bacon and Related Act Requirements. All rulings and interpretations of the Davis-Bacon and Related Acts contained in 29 CFR Parts 1, 3, and 5 are herein incorporated by reference in this contract.

9. Disputes concerning labor standards. Disputes arising out of the labor standards provisions of this contract shall not be subject to the general disputes clause of this contract. Such disputes shall be resolved in accordance with the procedures of the Department of Labor set forth in 29 CFR Parts 5, 6, and 7. Disputes within the meaning of this clause include disputes between the contractor (or any of its subcontractors) and the contracting agency, the U.S. Department of Labor, or the employees or their representatives.

10. (i) Certification of Eligibility. By entering into this contract the contractor certifies that neither it (nor he or she) nor any person or firm who has an interest in the contractor's firm is a person or firm ineligible to be awarded Government contracts by virtue of Section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

(ii) No part of this contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of Section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1)..

(iii) The penalty for making false statements is prescribed in the U.S. Criminal Code, 18 U.S.C. 1001.

b. Contract Work Hours and Safety Standards Act. The provisions of this paragraph b are applicable where the amount of the prime contract exceeds $100,000. As used in this paragraph, the terms "laborers" and "mechanics" include watchmen and guards.

(1) Overtime requirements. No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any workweek in which the individual is employed on such work to work in excess of 40 hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of 40 hours in such workweek.

(2) Violation; liability for unpaid wages; liquidated damages. In the event of any violation of the clause set forth in subparagraph (b)(1) of this section, the contractor and any subcontractor responsible therefore shall be liable for the unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in subparagraph (b)(1) of this paragraph, in the sum of $10 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of 40 hours without payment of the overtime wages required by the clause set forth in sub paragraph (b)(1) of this section.

(3) Withholding for unpaid wages and liquidated damages. The Federal Agency or its designee shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld, from any moneys payable on account of work performed by the contractor or subcontractor under any such contract or any other Federal contract with the same prime contract, or any other Federally-assisted contract subject to the Contract Work Hours and Safety Standards Act which is held by the same prime contractor such sums as may be determined to be

necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in subparagraph (b)(2) of this section.

(4) Subcontracts. The contractor or subcontractor shall insert in any subcontracts the clauses set forth in subparagraph (b)(1) through (4) of this section and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in subparagraphs (b)(1) through (4) of this section.

C. In addition to the clauses contained in paragraph (b), in any contract subject only to the Contract Work Hours and Safety Standards Act and not to any of the other statutes cited in Sec. 5.1, the Agency Head shall cause or require the contracting officer to insert a clause requiring that the contractor or subcontractor shall maintain payrolls and basic payroll records during the course of the work and shall preserve them for a period of three years from the completion of the contract for all laborers and mechanics, including guards and watchmen, working on the contract. Such records shall contain the name and address of each such employee, social security number, correct classifications, hourly rates of wages paid, daily and weekly number of hours worked, deductions made, and actual wages paid. Further, the Agency Head shall cause or require the contracting officer to insert in any such contract a clause providing that the records to be maintained under this paragraph shall be made available by the contractor or subcontractor for inspection, copying, or transcription by authorized representatives of the (write the name of agency) and the Department of Labor, and the contractor or subcontractor will permit such representatives to interview employees during working hours on the job.

D. Compliance Verification.

(a) The Recipient shall periodically interview a sufficient number of employees entitled to DB prevailing wages (covered employees) to verify that contractors or subcontractors are paying the appropriate wage rates. As provided in 29 CFR 5.6(a)(6), all interviews must be conducted in confidence. Use Standard Form 1445 (SF 1445) or equivalent documentation to memorialize the interviews. Copies of the SF 1445 are available from the funding agency upon request.

(b) The Recipient shall establish and follow an interview schedule based on its assessment of the risks of noncompliance with DB posed by contractors or subcontractors and the duration of the contract or subcontract. At a minimum, the Recipient should conduct interviews with a representative group of covered employees within two weeks of each contractor or subcontractor's submission of its initial weekly payroll data and two weeks prior to the estimated completion date for the contract or subcontract. The Recipient must conduct more frequent interviews if the initial interviews or other information indicates that there is a risk that the contractor or subcontractor is not complying with DB. The Recipient shall immediately conduct necessary interviews in response to an alleged violation of the prevailing wage requirements. All interviews shall be conducted in confidence.

(c) The Recipient shall periodically conduct spot checks of a representative sample of weekly payroll data to verify that contractors or subcontractors are paying the appropriate wage rates. The Recipient shall establish and follow a spot check schedule based on its assessment of the risks of noncompliance with DB posed by contractors or subcontractors and the duration of the contract or subcontract. At a minimum, if practicable the Recipient shall spot check payroll data within two weeks of each contractor or subcontractor's submission of its initial payroll data and

two weeks prior to the completion date the contract or subcontract. The Recipient must conduct more frequent spot checks if the initial spot check or other information indicates that there is a risk that the contractor or subcontractor is not complying with DB. In addition, during the examinations the Recipient shall verify evidence of fringe benefit plans and payments thereunder by contractors and subcontractors who claim credit for fringe benefit contributions.

(d) The Recipient shall periodically review contractors and subcontractors use of apprentices and trainees to verify registration and certification with respect to apprenticeship and training programs approved by either the U.S Department of Labor or a state, as appropriate, and that contractors and subcontractors are not using disproportionate numbers of, laborers, trainees and apprentices. These reviews shall be conducted in accordance with the schedules for spot checks and interviews described in Item (b) and (c) above.

(e) The Recipient must immediately report potential violations of the DB prevailing wage requirements to the funding agency DB contact listed above and to the appropriate DOL Wage and Hour District Office listed at http://www.dol.gov/whd/america2.htm.

11. AGENCY SPECIFIC PROVISIONS:

Note: Failure to comply with these specifications e.g., taking the specified steps prior to Bid opening, and to submit the forms with the Bid will lead to the Bid being declared **non-responsive** and, therefore, shall be rejected.

11.1. All EPA Funded Contracts:

1. Federal Disadvantaged Business Enterprise (DBE) regulations apply to this project. (Reference 40 Code of Federal Regulations Part 33 - Participation by Disadvantaged Business Enterprises in U.S. Environmental Protection Agency Programs).

2. The responsive Bid shall conform to GFE to increase DBE awareness of procurement opportunities through race and gender neutral efforts. Race and gender neutral efforts are ones which increase awareness of contracting opportunities in general, including outreach, recruitment and technical assistance.

3. Bidder agrees that it will cooperate with and assist the City in fulfilling the DBE Good Faith Effort Requirement achieving "fair share objectives" and will exercise GFE to achieve such minimum participation of small, minority and women owned businesses. In particular, in submitting a bid, the Bidder shall, in the selection of Subcontractors, and Suppliers for the procurement of equipment, supplies, construction, and services related to the project, at a minimum, undertake the affirmative GFE steps.

4. In accordance with EPA's Program for Utilization of Small, Minority Disadvantaged and Women Business Enterprises in procurement under Federal assistance programs, the Contractor agrees to the applicable "fair share objectives" as specified in the Notice Inviting Bids.

5. The provisions in the Contract Documents have been incorporated to prevent unfair practices that adversely affect DBEs.

6. If a DBE Subcontractor fails to complete the Work under the subcontract for any reason, the Contractor shall employ the 6 GFE if soliciting a replacement Subcontractor. The Contractor shall employ the 6 GFE described below even if the Contractor has achieved its fair share objectives.

7. Good Faith Efforts:

   a) The Contractor shall demonstrate that efforts were made to attract DBEs on this contract. The "Good Faith" effort requires the Contractor and any Subcontractors to take the steps listed in these specifications to assure that DBEs are used whenever possible as sources of supplies, construction, equipment, or services even if the Contractor has achieved its fair share objectives.

   b) If the Contractor awards subcontracts, it shall require the Subcontractors to take the steps in these specifications.

   c) For the EPA defined GFE, see the steps below:

      1. Ensure DBEs are made aware of contracting opportunities to the fullest extent practicable through outreach and recruitment activities. For Indian Tribal, State and Local and Government recipients, this will include placing DBEs on solicitation lists and soliciting them whenever they are potential sources.

      2. Make information on forthcoming opportunities available to DBEs and arrange time frames for contracts and establish delivery schedules, where the requirements permit, in a way that encourages and facilitates participation by DBEs in the competitive process. This includes, whenever possible, posting solicitations for bids or proposals for a minimum of 30 days before the bid or proposal closing date.

      3. Consider in the contracting process whether firms competing for large contracts could subcontract with DBEs. For Indian Tribal, State and local Government recipients, this will include dividing total requirements when economically feasible into smaller tasks or quantities to permit maximum participation by DBEs in the competitive process. Include with the GFE documentation a completed copy of the form AA61, "List of Work Made Available."

      4. Encourage contracting with a consortium of DBEs when a contract is too large for one of these firms to handle individually.

      5. Use the services and assistance of the U.S. Small Business Administration (SBA) and the Minority Business Development Agency (MDBA) of the Department of Commerce (DOC). See

"DBE Potential Resources Centers" Section in a later part these specifications.

6. If the Contractor awards Subcontracts, the Contractor shall take the steps in paragraphs (1) through (5) above.

11.2. Annual DBE Utilization Reporting:

The Contractor shall report to the City on an annual basis, their utilization of Minority Business Enterprise and Women's Business Enterprise Subcontractors and Suppliers using Form 5700-52A.

11.2.1. Safe Drinking Water State Revolving Fund (SDWSRF) Contracts:

11.2.2. For contracts subject to SDWSRF, refer to Subsection 11.1, "All EPA Funded Contracts" above and the following:

1. Each Bid shall include submission of Disadvantaged Business Enterprise Information Form, identifying each proposed Subcontractor and Supplier for the Project.

2. Using the Disadvantaged Business Enterprise Information Form, the Bidder shall provide the following information for each proposed Subcontractor and Supplier:

    1. firm's name;
    2. contact person;
    3. entity's mailing address,
    4. telephone number;
    5. e-mail address;
    6. the procurement on which the proposed Subcontractor and Supplier quoted, and when; and
    7. proposed Subcontractor and Supplier status as a DBE or non-DBE.

3. The Apparent Low Bidder shall submit documentation showing that, prior to Bid opening, the required GFE was made. The documentation shall be received by the City within **4 Working Days** following Bid opening, except the Disadvantaged Business Enterprise Information Form, which is to be submitted with the Bid. Failure to submit Disadvantaged Business Enterprise Information Form with the Bid will cause the Bid to be rejected as **non-responsive.**

4. If the Apparent Low Bidder is rejected or considered as non-responsible or has any non-responsive low DBE Subcontractor, a complete explanation must be provided to the City.

5. Using the Verification of Qualification form below, Apparent Low Bidder shall provide evidence of certification by a federal, state, or local government entity for each DBE firm to be utilized. Such certification documentation shall be submitted within 4 Working Days following bid opening.

6. If additional procurement becomes necessary after the Award of the Contract, the GFE shall be applied, and, if DBE Subcontracts are awarded, Verification of Qualification shall be provided to the City by the Contractor within 10 Working Days following the award of each new Subcontract.

7. Any deviation from the information contained in Disadvantaged Business Enterprise Information Form shall not result in a reduction of DBE participation without prior approval of the City.

8. Failure of the Apparent Low Bidder to perform the 6 affirmative GFE steps prior to Bid opening, to submit Disadvantaged Business Enterprise Information Form with its bid, or both will lead to Bid being declared non-responsive. The City may then award the contract to the next low responsive, responsible Bidder meeting the requirements of these contract provisions.

9. The Contractor shall provide each proposed Subcontractor and Supplier copies of EPA Form 6100-2 and EPA Form 6100-3.

10. See "DBE Potential Resources Centers" Section in a later part these specifications.

11.2.3. <u>Annual DBE Utilization Reporting:</u>

The Contractor shall report to the City on a annual basis, their utilization of Minority Business Enterprise and Women's Business Enterprise Subcontractors and Suppliers using California State Revolving Funds (CASRF) Form UR-334.

12. DBE POTENTIAL RESOURCES CENTERS:

12.1. Utilization of the US Small Business Administration (SBA) and Minor Business Development Agency (MBDA) resources is required at no cost. These agencies offer several services, including Internet access to databases of DBEs.

12.2. For additional assistance, the recipient or contractor can telephone the local offices of both agencies in their area (SBA Minority Enterprise Development Offices and DOC MBDA Regional Centers). The Internet web sites also include names, addresses, and phone or fax numbers of local SBA and MBDA centers. Do not write to these sources

12.3. The Contractor shall provide documentation that the local SBA/MBDA offices or web sites were notified of the contracting bid opportunity at least 15 Working Days prior to Bid opening and solicitation to DBE subcontractors at least 10 Working

Days prior to Bid opening. Documentation shall not only include the efforts to contact the information sources and list the Contract opportunity, but also the solicitation and response to the bid request.

12.4. Include qualified DBEs on solicitation lists and record the information on Form AA63. Solicitation shall be as broad as possible.

12.5. If DBE sources are not located, explain why and describe the efforts made.

12.6. The Contractor shall send invitations to at least 3 (or all, if less than 3) DBE vendors for each item of work referred by sources contacted. The invitations shall adequately specify the items for which bids are requested. The record of "good faith" efforts shall indicate a real desire for a positive response, such as a certified mail receipt or a documented telephone conversation.

12.7. A regular letter or an unanswered telephone call is not an adequate "good faith" effort. A list of all sub-bidders, including the bidders not selected and non DBE Subcontractors, and bid amount for each item of the Work shall be submitted on Form AA62. If a low bid was not accepted, an explanation shall be provided.

12.8. Federal Agencies (must be contacted and solicitations posted on their websites):

Name and Address	Telephone and Web Site
U.S. Small Business Administration	(415) 744-6820 Extension 0
455 Market Street, Suite 600	Dynamic Small Business Search: http://dsbs.sba.gov/dsbs/search/dsp_dsbs.cfm[1]
San Francisco, CA 94105	Bid Notification: https://eweb1.sba.gov/subnet/common/dsp_login.cfm[2]
RE: Minority Enterprise Development Offices	
U.S. Department of Commerce	(415) 704-7415
Minority Business Development Agency	Bid Notification:
211 Main Street, Room 1280	http://www.mbda.gov/workspace[3]
San Francisco, CA 94105	RE: Business Development Centers

12.9. State Agencies (must be contacted):

Name and Address	Telephone and Web Site
California Department of Transportation	Mailing Address: PO Box 942874
(CALTRANS) Business Enterprise Program[4]	Sacramento, CA 94274-0015
1820 Alhambra Blvd.	(916) 227-9599
Sacramento, CA 95816	DBE Database: http://www.dot.ca.gov/hq/bep/find_certified.htm
CA Public Utilities Commission (CPUC)[5]	
505 Van Ness Avenue	Directory: https://sch.thesupplierclearinghouse.com/FrontEnd/SearchCertifiedDirectory.asp
San Francisco, CA 94102-3298	

Notes:

1. The Contractor shall use the SBA's Dynamic Small Business Search database to search for potential subcontractors, suppliers, and/or manufacturers. Provide a copy of search records with GFE documentation.
2. The Contractor shall use SUB-Net to post subcontracting opportunities. The Contractor shall post Subcontractor opportunities at least 15 Working Days prior to bid opening. Small businesses can review this web site to identify opportunities in their areas of expertise. The web site is designed primarily as a place for large businesses to post solicitations and notices. Provide copy of the Display Solicitation Record with the GFE documentation.
3. The Contractors shall use MBDA web portal to post subcontracting opportunities. The Contractor shall post subcontractor opportunities at least 15 Working Days prior to Bid opening. Small businesses can review this web site to identify opportunities in their areas of expertise. The web site is designed primarily as a place for large businesses to post solicitations and notices. Provide copy of the Offer Overview with the GFE documentation.
4. Based on the federal DBE program, CALTRANS maintains a database and provides directories of minority and woman-owned firms. Provide copy of search records with GFE documentation.
5. CPUC maintains a database of DBE-owned business enterprises and serves to inform the public. Provide copy of search records with GFE documentation.

13. GOOD FAITH EFFORT DOCUMENTATION SUBMITTALS:

13.1. The affirmative GFE steps documentation shall be submitted **within 4 Working Days of the Bid Opening**. If this documentation is not submitted when due, the City will declare the Bid **non-responsive** and reject it.

13.2. The required documentation shall be submitted and logged in at the following address:

CITY OF SAN DIEGO
PUBLIC WORKS CONTRACTS
1010 SECOND AVENUE, 14TH FLOOR, MS 614C
SAN DIEGO, CA 92101
SUBJECT: AFFIRMATIVE GOOD FAITH EFFORT DOCUMENTATION
BID NO. **K-17-1401-DBB-3**

13.3. The Contractor shall maintain the records documenting compliance with requirements including documentation of its GFE and data relied upon in formulating its fair share objectives.

14. FORMS:

14.1. The Contractor shall demonstrate that efforts were made to attract DBEs on this contract. The Contractor and Subcontractors shall take the steps listed in these specifications to assure that DBEs are used whenever possible as sources of supplies, construction, equipment, or services. In addition to the specified GFE documentation, the Bidder shall submit the following forms:

14.1.1. The following forms shall be completed and submitted within **4 Working Days of the Bid opening**. Failure to include any of the forms shall cause the Bid to be deemed **non-responsive**.

1. CASRF Form UR-334
2. EPA Form 5700-52A MBE/WBE Utilization Forms
3. SDWSRF Verification of Qualification
4. Form AA61 List of Work Made Available
5. Form AA62 Summary of Bids Received
6. Form AA63 Good Faith Effort List of Subcontractors Solicited

FUNDING AGENCY PROVISIONS

FORMS

STATE WATER RESOURCES CONTROL BOARD – DIVISION OF FINANCIAL ASSISTANCE
DISADVANTAGED BUSINESS ENTERPRISE (DBE) UTILIZATION
CALIFORNIA STATE REVOLVING FUNDS (CASRF)
FORM UR-334

1. Grant/Finance Agreement Number:	2. Annual Reporting Period 10/1/__ through 09/30/__	3. Purchase Period of Financing Agreement:
4. Total Payments Paid to Prime Contractor or Sub-Contractors During Current Reporting Period: $		
5. Recipients Name and Address:	6. Recipient' s Contact P erson and P hone Num ber:	

7. List All DBE Payments Paid by Recipient or Prime Contractor During Current Reporting Period:

Payment or Purchase Paid by Recipient or Prime Contractor	Amount Paid to Any DBE Contractor or Sub-Contractor For Service Provided to Recipient		Date of Payment (MM/DD/YY)	Procurement Type Code** (see below)	Name and Address of DBE Contractor of Sub-Contractor or Vendor
	MBE	WBE			

8. Initial here if no DBE contractors or sub-contractors paid during current reporting period:
9. Initial here if all procurements for this contract are completed:
10. Comments:

11. Signature and Title of Recipient's Authorized Representative	12. Date

Return to:
Barbara August
Division of Financial Assistance
SWRCB
PO Box 944212
Sacramento, CA 94244-2120

Barbara.August@waterboards.ca.gov
Phone: (916) 341-6952
Fax: (916) 327-7469

Procurement Type:
1. Construction
2. Supplies
3. Services (includes business services; professional services; repair services and personnel services)
4. Equipment

December 2014

STATE WATER RESOURCES CONTROL BOARD - DIVISION OF FINANCIAL ASSISTANCE
DISADVANTAGED BUSINESS ENTERPRISE (DBE) UTILIZATION
CALIFORNIA STATE REVOLVING FUNDS
INSTRUCTIONS FOR COMPLETING FORM UR-334

Box 1 Grant or Financing Agreement Number.

Box 2 Annual reporting period.

Box 3 Enter the dates between which you made procurements under this financing agreement or grant.

Box 4 Enter the total amount of payments paid to the contractor or sub-contractors during this reporting period.

Box 5 Enter Recipient's Name and Address.

Box 6 Enter Recipient's Contact Name and Phone Number.

Box 7 Enter details for the **DBE purchases only** and be sure to limit them to the current period. 1) Use either an "R" or a "C" to represent "Recipient" or "Contractor." 2) Enter a dollar total for DBE and total the two columns at the bottom of the section. 3) Provide the payment date. 4) Enter a product type choice from those at the bottom of the page. 5) List the vendor name and address in the right-hand column

Box 8 Initial here if no DBE contractors or sub-contractors were paid during this reporting period.

Box 9 Initial this box only if all purchases under this financing agreement or grant have been completed during this reporting period or a previous period. If you initial this box, we will no longer send you a survey.

Box 10 This box is for explanatory information or questions.

Box 11 Provide an authorized representative signature.

Box 12 Enter the date form completed.

CALIFORNIA DEPARTMENT OF PUBLIC HEALTH
SAFE DRINKING STATE REVOLVING FUND PROGRAM
MBE/WBE UTILIZATION
FOR COMPLIANCE WITH
FEDERAL SDWSRF REQUIREMENTS

PART I. (Reports are required even if no procurements are made during the reporting period.)

1A. FEDERAL FISCAL YEAR 20_____	1B. REPORTING PERIOD (Check ALL appropriate boxes) □ 1st (Oct-Dec) □ 2nd (Jan-Mar) □ 3rd (Apr-Jun) □ 4th (Jul-Sep) □ Annual □ Check if this is the last report for the project (Project completed).		
1C. REVISION OF A PRIOR REPORT? □Yes □No Year: _____ Quarter: _____	BRIEFLY DESCRIBE THE REVISIONS YOU ARE MAKING:		
2A. SUBMIT REPORT TO: Safe Drinking Water State Revolving Fund Program MBE/WBE Coordinator (MS 7418) 1616 Capitol Avenue P.O. Box 997413 Sacramento, CA 95899-7413		3A. SDWSRF FUNDING RECIPIENT NAME AND ADDRESS 3B. SDWSRF FUNDING AGREEMENT NUMBER:	
2B. STATE CONTACT Mally Vue (mally.vue@cdph.ca.gov)	2C. PHONE/FAX: (916) 449-5600 (916) 449-5656	3C. RECIPIENT REPORTING CONTACT: Name: E-mail:	3D. PHONE: Fax:
4A. TOTAL SDWSRF FUNDING ASSISTANCE AMOUNT SDWSRF LOAN: $_____ SDWSRF GRANT: $_____	4B. If **NO procurement and NO accomplishments** were made this reporting period, check **and skip** to Block No. 7. (Procurements are all expenditures through contract, order, purchase, lease or barter of supplies, equipment, construction, or services needed to complete Federal assistance programs. Accomplishments, in this context, are procurements made with MBEs and/or WBEs. □		

4C. **Total Procurements and MBE/WBE Accomplishments This Reporting Period**

(Only include amount not reported in any prior reporting period)

Were procurements made under this SDWSRF funding assistance during this reporting period? Yes □ No □

Total procurement made with SDWSRF funding assistance during this reporting period: Amount

$_____

Actual MBE/WBE Accomplishment with SDWSRF funding assistance during this reporting period:

	Construction	Equipment	Services	Supplies	Total
$MBE:	$_____	$_____	$_____	$_____	$_____
$WBE:	$_____	$_____	$_____	$_____	$_____

5. COMMENTS: (If no MBE/WBE procurements were accomplished during the reporting period, please explain what steps you are taking to achieve the MBE/WBE Program requirements specified in the terms and conditions of the Assistance Agreement.)

7. NAME OF RECIPIENT'S AUTHORIZED REPRESENTATIVE	TITLE
8. SIGNATURE OF RECIPIENT'S AUTHORIZED REPRESENTATIVE	DATE

Use for EPA FORM 5700-52A

CDPH SDWSRF MBE/WBE UTILIZATION REPORT FOR COMPLIANCE WITH FEDERAL SDWSRF FUNDING REQUIREMENTS							
A. WATER SYSTEM NAME:		B. PROJECT TITLE		C. SDWSRF LOAN NUMBER			D. CLAIMS SUBMITTED From _____ to _____ (date) (date)
1. Procurement Made By		2. Business Enterprise		3. $ Value of Procurement	4. Date of Award:	5. Type of Product or Services (Enter Code)	6. MBE/WBE Contractor or Subcontractor/Vendor Firm/Contact/Phone
Water System	Contractor	Minority	Women				
							FIRM CONTACT ADDR CITY/ZIP PH:
							FIRM CONTACT ADDR CITY/ZIP PH:
							FIRM CONTACT ADDR CITY/ZIP PH:
							FIRM CONTACT ADDR CITY/ZIP PH:
							FIRM CONTACT ADDR CITY/ZIP PH:
							FIRM CONTACT ADDR CITY/ZIP PH:

Type of product or service codes			
1 = Construction	2 = Supplies	3 = Services	4 = Equipment

Note: Refer to Terms and conditions of your Assistance Agreement to determine the frequency of reporting. Recipients are required to submit MBE/WBE reports to EPA beginning with the Federal fiscal year quarter the recipients receive the award, continuing until the project is completed.

CDPH MBE/WBE UTILIZATION FORM (Use for EPA 5700-52)

MINORITY BUSINESS ENTERPRISE/WOMEN'S BUSINESS ENTERPRISE (MBE/WBE)[1]
VERIFICATION OF QUALIFICATION

CALIFORNIA DEPARTMENT OF PUBLIC HEALTH
DIVISION OF DRINKING WATER AND ENVIRONMENTAL MANAGEMENT

Firm Name:	**Phone:**
Address:	
Principal Service or Product:	
☐ - **MBE** ☐ - **WBE**	
☐-**Prime Contractor** ☐ - **Supplier of Material/Service** ☐ - **Subcontractor** ☐ - **Broker**	
☐ - **Sole Ownership** ☐ - **Corporation** ☐ - **Partnership** ☐ - **Joint Venture**	

Names of Owners	Percent Ownership	MBE– Ethnic Identity[2]	WBE

Agency Certifying MBE/WBE Qualification	
Certifying Agency Address	**Certifying Agency Phone**
Certification number	**Date Certified**
Submitted by:	**Date**

[1]Refer to definitions on next page.

MINORITY BUSINESS ENTERPRISE/WOMEN'S BUSINESS ENTERPRISE (MBE/WBE)

An MBE is a business that is, (1) at least 51 percent owned and controlled by one or more minority individuals, or, in the case of a publicly owned business, at least 51 percent of the stock is owned by one or more minority individuals; and (2) whose daily business operations are managed and directed by one or more of the minority owners.

A WBE is a business that is, (1) at least 51 percent owned by one or more women, or, in the case of a publicly owned business, at least 51 percent of the stock is owned by one or more women; and, (2) whose daily business operations are managed and directed by one or more of the women owners.

MINORITY INDIVIDUALS INCLUDE:

(a) American Indians

Persons having origins in any of the original peoples of North America. To qualify in this group, a person shall be a citizen of the United States and meet one or more qualifying criteria including:

(1) Be at least one-fourth Indian descent (as evidenced by registration with the Bureau of Indian Affairs);

(2) Characteristic Indian name;

(3) Recognition in the community as an Indian;

(4) Membership in a tribe, band or group of American Indians (recognized by the Federal Government), as evidenced by a tribal enrollment number or similar indication; and

(5) Characteristic Indian appearance and features.

(b) Black Americans

U.S. citizens, other than Hispanic, having origins in any of the black racial groups of Africa.

(c) Asian Americans

U.S. citizens having origins in any of the original peoples of the Far East, Southern Asia, the Indian subcontinent or the Pacific Islands. This area includes, for example, China, Japan, Korea, the Philippine Islands and Samoa. The Indian subcontinent takes in the countries of India, Pakistan, Bangladesh, Sri Lanka, Nepal, Sikkim, and Bhutan.

(d) Hispanic Americans

U.S. citizens of Mexican, Puerto Rican, Cuban, or other Spanish culture or origin, regardless of race. Only those persons from Central and South American countries who are of Spanish origin, descent, or culture should be included in this category. Persons from Brazil, Guyana, Surinam or Trinidad, for example, would be classified according to their race and would not necessarily be included in the Hispanic category. In addition, the category does not include persons from Portugal, who should be classified according to race.

(e) American Eskimos and American Aleuts

CDPH MBEWBE Verification Form (11/2010 mv)

LIST OF WORK MADE AVAILABLE

List items of the Work the Bidder made available to DBE firms. Identify those items of the Work the Bidder might otherwise perform with its own forces and those items that have been broken down into economically feasible units to facilitate DBE participation. For each item listed, show the dollar amount and percentage of the Base Bid. The Bidder must demonstrate that enough work to meet the goal was made available to DBE firms.

ITEM OF WORK MADE AVAILABLE	NAICS CODE	BIDDER NORMALLY PERFORMS ITEM (Y/N)	ITEM BROKEN DOWN TO FACILITATE PARTICIPATION (Y/N)	AMOUNT	PERCENTAGE OF BASE BID

SUMMARY OF BIDS RECEIVED

Type of Job	NAICS CODES	Company Name	Selected (Y/N)	Bid Amount	DBE	Non-DBE	Explanation for not Selecting

USE ADDITIONAL FORMS AS NECESSARY

DISADVANTAGE BUSINESS ENTERPRISE (DBE)
GOOD FAITH EFFORT LIST OF SUBCONTRACTORS SOLICITED

Contractor Name	Contractor Address	How Located	Date of Contact	Contact Method	Task Description	Response (Yes/No)

USE ADDITIONAL FORMS AS NECESSARY

ATTACHMENT E

SUPPLEMENTARY SPECIAL PROVISIONS

SUPPLEMENTARY SPECIAL PROVISIONS

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

1) Standard Specifications for Public Works Construction (The GREENBOOK) currently in effect.

2) The City of San Diego Standard Specifications for Public Works Construction (The WHITEBOOK).

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

1-2 TERMS AND DEFINITIONS.

Normal Working Hours. To the City Supplement, ADD the following:

The Normal Working Hours at the pump station site are **8:00 AM to 4:30 PM.**

Other working hours may be required for the pipeline installation and shall be indicated on the traffic control plans.

SECTION 2 - SCOPE AND CONTROL OF WORK

2-3.2 Self Performance. 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.

2-5.3.1 General. To the City Supplement, ADD the following

7. For products for which an AML is available, products listed in the AML shall be used. A submittal review will be conducted for products not identified on an AML on a case-by-case basis when:

   a) The product type or category is not in the AML.

   b) The AML does not list at least two available manufacturers of the product.

   c) The material or manufacturer listed in the AML is no longer available. Documentation to substantiate the product is no longer available or in production is required as part of the submittal.

In the case of conducting a submittal review when required by the Plans or Special Provisions, or when requested by the Engineer, all submittals shall be accompanied by the City's submittal form.

The Product Submittal Form is available for download at:

http://www.sandiego.gov/publicworks/edocref/index.shtml

2-5.3.2 Working Drawings. TABLE 2-5.3.2(A), ADD the following:

Item	Section No.	Title	Subject
17	306-1.6	Water Valve Bypass for Mainlines 16" and Larger	SDW-154*

*Note: The distance dimensions shown between the bypass pipes and the mainlines are subject to change to field conditions.

2-7 SUBSURFACE DATA. 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:

    1. Geotechnical Study dated September 2, 2014 by VO Engineering Inc. See Appendix N.

2-9.1 Permanent Survey Markers. To the City Supplement, DELETE in its entirety and SUBSTITUTE with the following:

1. Pursuant to Division 3, Chapter 15 of the Business and Professions Code, you shall not disturb survey monuments that "control the location of subdivisions, tracts, boundaries, roads, streets, or highways, or provide horizontal or vertical survey control" until they have been tied out by a Registered Land Surveyor or Registered Civil Engineer authorized to practice land surveying within the State of California.

2. Monument Preservation shall be performed by the City's Construction Management and Field Services (CMFS) Division on all Projects, unless permission is obtained for these services in writing by CMFS.

3. You shall submit to the Engineer a minimum of 7 Days prior to the start of the Work a list of controlling survey monuments which may be disturbed. CMFS shall do the following:

    a) Set survey points outside the affected Work area that reference and locate each controlling survey monument that may be disturbed.

b) File a Corner Record or Record of Survey with the County Surveyor after setting the survey points to be used for re-establishment of the disturbed controlling survey monuments.

c) File a Corner Record of Record of Survey with the County Surveyor after re-establishment of the disturbed controlling survey monuments.

2-14.2 Integration of the Work with Separate Contractors. To the City Supplement, ADD the following:

The list of Separate Contractors includes:

1. Mid-City Pipeline – Contractor to be determined.

SECTION 4 - CONTROL OF MATERIALS

ADD:

4-1.1.1 American Iron and Steel (AIS).

The Consolidated Appropriations Act, 2014, includes an "American Iron and Steel (AIS)" requirement in section 436 that requires this project, funded via the Clean Water State Revolving Loan Fund (CWSRF) and/or the Drinking Water State Revolving Loan Fund (DWSRF) to use iron and steel products that are produced in the United States for projects for the construction, alteration, maintenance, or repair of a public water system.

1. You acknowledge to and for the benefit of the City of San Diego and the State Water Resource Control Board that you understand the Work under this Contract is being funded with monies made available by the Clean Water State Revolving Fund and/or Drinking Water State Revolving Fund that have statutory requirements commonly known as "American Iron and Steel" that requires all of the iron and steel products used for construction to be produced in the United States including iron and steel products to be provided by you. You hereby warrant to and for the benefit of the City and the State that:

   a) You have reviewed and understand the American Iron and Steel Requirement,

   b) All of the iron and steel products used in the project will be and/or have been produced in the United States in a manner that complies with the American Iron and Steel Requirement with required certification (for sample certification letters, refer to Appendix "_K_"), unless a waiver of the requirement is approved, and;

   c) You will provide any further verified information, certification or assurance of compliance with this paragraph, or information

necessary to support a waiver of the American Iron and Steel Requirement, as may be requested by the City or the State.

2. The additional information below is being provided for reference and guidance to ensure that you comply with all requirements set forth by the CWSRF and/or DWSRF Loans:

a) Refer to the following EPA website:

http://www.epa.gov/cwsrf/state-revolving-fund-american-iron-and-steel-ais-requirement

b) The United States Environmental Protection Agency's Memorandum dated March 20, 2014 entitled, "Implementation of American Iron and Steel Provisions of P.L. 113-76, Consolidated Appropriations Act, 2014":

https://www.epa.gov/sites/production/files/2015-09/documents/ais-final-guidance-3-20-14.pdf

3. Your failure to comply with this provision shall permit the City or State to recover damages against you for any loss, expense, or cost (including without limitation attorney's fees) incurred by the City or State resulting from any such failure (including without limitation any impairment or loss of funding, whether in whole or in part, from the State or any damages owed to the State by the City). Although you have no direct contractual privity with the State, as a lender to the City for the funding of this project, you and the City agree that the State is a third-party beneficiary and neither this provision (nor any other provision of this Contract necessary to give this provision force or effect) shall be amended or waived without the prior written consent of the State.

4-1.3.3 Inspection of Items Not Locally Produced. ADD the following:

The Engineer will perform inspection of out-of-town manufacturer for the items of Work specified here:

a) Large Diameter pipe, which may include 24, 30, 36 and 66 inch CML&C steel pipe.

4-1.3.4 Inspection Paid For By the Contractor. To the City Supplement, ADD the following:

a) Welding Inspectors

b) Building specialty inspector's (currently certified by City SD DSD)

c) Pump Inspectors; motor control center inspection.

4-1.3.6 Preapproved Materials. To the City Supplement, 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.** ADD the following:

You shall submit your list of proposed substitutions for "an equal" ("or equal") item(s) **no later than 5 Working Days after the determination of the Apparent Low Bidder** and on the City's Product Submittal Form available at.

http://www.sandiego.gov/publicworks/edocref/index.shtml

4-1.10 **Foreign Materials.** To the City Supplement, DELETE in its entirety and SUBSTITUTE with the following:

Materials that are manufactured, produced, or fabricated outside of the United States shall be delivered to a distribution point in California, unless otherwise specified. Quality Control and related testing shall be performed to all applicable specified US standards. Manufacturer's testing and staff certification shall be traceable to a United States regulatory agency. Retain the materials for a sufficient period of time to permit inspection, sampling, and testing. You shall not be entitled to an extension of time for acts or events occurring outside of, at point of entry, or during transport to the United States.

SECTION 5 – UTILITIES

5-2 **PROTECTION.** ADD the following:

1. You shall repair or replace traffic signal and lighting system equipment within 72 hours after notification of defects by the Engineer.

2. While working in or around meter boxes, you shall protect in place all Advanced Metering Infrastructure (AMI) devices attached to the water meter or located in or near water meter boxes, coffins, or vaults in accordance with **Appendix O**. This includes any antenna installed through the meter box lid.

    a) Avoid damaging the antenna, cable, and endpoints when removing the meter box lid and when disconnecting AMI endpoints from the register on top of the water meter.

    b) If meters or AMI devices need to be removed or relocated, the AMI endpoints shall be reinstalled with the Encoder/Receiver/Transmitter (ERT) pointing upwards.

    c) Because the AMI equipment is uniquely matched to each service location and to specific meter serial numbers, any AMI devices that are removed or disconnected shall be reinstalled on the same service lateral as well as to the same meter serial number it was attached to originally.

    d) Do not change or modify the lid if the lid has an antenna drilled through it.

e) If you encounter damaged, disconnected, buried, or broken AMI endpoints, cables between the registers, antennae, lids, or ERTs, notify the Engineer within 24 hours.

f) Any AMI equipment damaged by you shall be repaired or replaced by City Forces at your expense.

SECTION 6 - PROSECUTION, PROGRESS AND ACCEPTANCE OF WORK

6-1.1 **Construction Schedule.** To item 20, ADD the following:

The 90 Calendar Day for the Plant Establishment Period is included in the stipulated Contract Time.

6-2.1 **Moratoriums.** To the City Supplement, ADD the following:

Do not work in the areas where there is currently a moratorium issued by the City. The areas subject to moratorium are listed here:

a) Business areas' on El Cajon Blvd. from **Thanksgiving to New Year's Day Holidays.**

6-7.1 **General.** To the City Supplement, ADD the following:

5. For Water projects where shutdowns of 16 inch and larger pipes are required, there is a shutdown moratorium from May until October. Contractor shall plan and schedule work accordingly. No additional payment or working days will be granted for delays due to this moratorium.

6. 30 Working days for full depth asphalt final mill and resurfacing work required per SDG-107.

SECTION 7 - RESPONSIBILITIES OF THE CONTRACTOR

7-3 **LIABILITY INSURANCE.** DELETE in its entirety and SUBSTITUTE with the following:

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 must 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:

General Annual Aggregate Limit	Limits of Liability
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.

7-3.2.5 Contractors Builders 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.

7-3.5.5 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.

7-4 WORKERS' COMPENSATION INSURANCE. DELETE in its entirety and SUBSTITUTE with the following:

7-4.1 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:

Workers' Compensation	Statutory Employers Liability
Bodily Injury by Accident	$1,000,000 each accident
Bodily Injury by Disease	$1,000,000 each employee
Bodily Injury by Disease	$1,000,000 policy limit

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.

7-4.1.1 **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.

7-5 **PERMITS, FEES, AND NOTICES.** To the City Supplement, ADD the following:

The City will obtain, at no cost to the Contractor; the following permits:

1. Contractor will pull Building permit for the Pump Station; City pays the fee via internal fund transfer.

7-8.6 **Water Pollution Control.** ADD the following:

1. Based on a preliminary assessment by the City, the Contract is subject to **WPCP.**

7-10.5.3 **Steel Plate Covers.** Table 7-10.5.3(A), REVISE the plate thickness for 5'-3" trench width to read 1 ¾".

7-15 **INDEMNIFICATION AND HOLD HARMLESS AGREEMENT.** To the City Supplement, fourth paragraph, last sentence, DELETE in its entirety and SUBSTITUTE with the following:

Your duty to indemnify and hold harmless does not include any claims or liability arising from the established active or sole negligence, or willful misconduct of the City, its officers, or employees.

7-16 **COMMUNITY LIAISON.** To the City Supplement, DELETE in its entirety and SUBSTITUTE with the following:

ADD:
7-16 **COMMUNITY OUTREACH.**

7-16.1 **General.**

1. To ensure consistency with the City's community outreach plan for the project, the City shall work with you to inform the public (which includes, but shall not be limited to, property owners, renters, homeowners, business owners, recreational users, and other community members and stakeholders) of construction impacts. Your efforts to mitigate construction

impacts by communicating with the public require close coordination and cooperation with the City.

2. You shall perform the community outreach activities required throughout the Contract Time. You shall assign a staff member who shall perform the required community outreach services.

3. You shall closely coordinate the Work with the businesses, institutions, residents, and property owners impacted by the Project.

4. Your example duties include notifying businesses, institutions, and residents of the commencement of construction activities not less than 5 Days in advance, coordinating access for vehicular and pedestrian traffic to businesses, institutions, and residences impacted by the Project, reporting activities at all Project progress meetings scheduled by the Engineer, attending the Project Pre-construction meeting, attending 2 community meetings, responding to community questions and complaints related to your activities, and documenting, in writing, as well as logging in all inquiries and complaints received into the City's internal public contact tracking system.

5. You shall execute the Information Security Policy (ISP) Acknowledgement Form - For Non-City Employees within 15 Days of the award of the Contract if any of the following apply:

   a) Your contact information is made available on any outreach materials.

   b) You will be the primary point of contact to resolve project related inquiries and complaints.

6. Electronic Communication.

   a) All inquiries and complaints shall be logged in to the City's internal public contact tracking system within 24 hours of receipt of inquiries and complaints.

   b) Any updates or a resolution of inquiries and complaints shall be documented in the City's internal public contact tracking system within 24 hours.

   c) Copies of email communications shall be saved individually on to the City's internal public contact tracking system in an Outlook Message Format (*.msg).

   d) All graphics, photos, and other electronic files associated with inquiries and/or complaints shall be saved into the individual records, located within the City's internal public contact tracking system.

7-16.1.1 Quality Assurance.

1. During the course of community outreach, you shall ensure that the character of all persons that conduct community outreach (distributing door hangers, attending community meetings, interacting with the public, and etc.) on your behalf shall:

   a. Have the ability to speak and comprehend English and/or Spanish, as appropriate for the community or public they are informing.

   b. Possess and display easily verifiable and readable personal identification that identifies the person as your employee.

   c. Have the interpersonal skills to effectively, professionally, and tactfully represent you, the project, and the City to the public.

7-16.1.2 Submittals.

1. You shall submit to the Resident Engineer, for review and approval, all drafts of letters, notices, postcards, door hangers, signs, mailing lists, proposed addresses for hand-delivery, and any other notices and letters that are to be mailed and or distributed to the public.

   a. Prior to distributing or mailing, you shall submit final drafts of letters, notices, postcards, door hangers, signs, and any other notices and letters to the Resident Engineer for final review and approval. Submit a PDF copy of the approved door hangers to the Engineer.

   b. After distributing or mailing, you shall submit verification of delivery and any copies of returned notices to the Resident Engineer. Submit a PDF copy of the approved letters and notices to the Engineer.

2. You shall use the City's internal public contact tracking system to identify and summarize communications (via phone, in person, and email) with the public within 24 hours of receipt, even if your response to the individual is still incomplete. You shall upload to the City's internal public contact tracking system copies of all written, electronic, and verbal communications and conversations with the public.

7-16.1.3 Weekly Updates Recipients. Submit a weekly correspondence with updates, traffic control issues and locations, lane closures, and any other pertinent information (with additional contact names given during award process) to the following recipients:

Alex Garcia, Senior Engineer, agarcia@sandiego.gov

John Stohr, Project Manager, jstohr@sandiego.gov

Resident Engineer, TBD

7-16.2 Community Outreach Services.

7-16.2.1 Public Notice by Contractor.

1. Post Project Identification Signs in accordance with 7-10.6.2, "Project Identification Sign".

2. Notify businesses, institutions, property owners, residents or any other impacted stakeholders, within a minimum 300 feet (90 m) radius of the Project, of construction activities and utility service interruptions not less than 5 Days in advance.

3. Furnish and distribute public notices in the form of door hangers using the City's format to all occupants and/or property owners along streets:

    a. Where Work is to be performed at least 5 Days before starting construction or survey activities or impacting the community as approved by the Resident Engineer.

    b. Within 5 Days of the completion of your construction activities where Work was performed, you shall distribute public notices in the form of door hangers, which outlines the anticipated dates of Asphalt Resurfacing or Slurry Seal.

    c. No less than 48 hours in advance and no more than 72 hours in advance of the scheduled resurfacing.

4. Leave the door hanger notices on or at the front door of each dwelling and apartment unit and at each tenant of commercial buildings abutting each of the street block segments. Where the front doors of apartment units are inaccessible, distribute the door hanger notices to the apartment manager or security officer.

5. Door Hanger Material: You shall use Blanks/USA brand, Item Number DHJ5B6WH, 1¼ inch (31.8 mm) Holes (removed), 2-up Jumbo Door Hanger in Bristol White, or approved equal.

6. Mailed Notice Material: You shall use Cougar by Domtar, Item Number 2834, or approved equal.

7. For all Work on private property, contact each owner and occupant individually a minimum of 15 Days prior to the Work. If the Work has been delayed, re-notify owners and occupants of the new Work schedule, as directed by the Resident Engineer.

8. A sample of public notices is included in the Contract Appendix.

7-16.2.2 Communications with the Public.

1. Coordinate access for vehicular and pedestrian traffic to businesses, institutions, and residences impacted by the Project.

2. You shall provide updates on construction impacts to the Resident Engineer. You shall notify the Resident Engineer in advance about time-sensitive construction impacts and may be required to distribute construction impact notices to the public on short notice.

3. You shall incorporate community outreach activities related to construction impacts in the baseline schedule and update the Resident Engineer with each week's submittal of the Three-Week Look Ahead Schedule.

4. At the request of the Resident Engineer, you shall attend and participate in project briefings at community meetings.

5. You shall coordinate with the Resident Engineer on all responses and actions taken to address public inquiries and complaints within the 24 hours that they are received.

7-16.2.3 Communications with Media.

1. The City may allow members of the media access to its construction site(s) on a case-by-case basis only.

2. Occasionally, uninvited members of the media may show up at construction Sites. Members of the media (including, but not limited to newspapers, magazines, radios, television, bloggers, and videographers) do not have the legal right to be in the construction Site without the City's permission.

3. In the event that media representatives arrive near or on the construction Site(s), you shall keep them off the Site(s) in a courteous and professional manner until a Public Information Officer is available to meet them at an approved location.

4. You shall report all visits from members of the media to the Resident Engineer as quickly as possible so that the City's Public Information Officer can meet with the members of the media at the construction Site(s).

5. If the City allows members of the media to access a construction Site, you shall allow the City to escort the media representatives while they are on the construction Site and shall ensure their safety.

6. You shall require media representatives to sign in and out of the Site Visitor Log and to use personal protective equipment.

7. You have a right to speak to members of the media about your company and its role on the project. All other questions shall be referred to the City.

7-16.3 Exclusive Community Liaison Services.

1. You shall retain an Exclusive Community Liaison for the Project whose sole responsibilities shall be to implement 7-16.2, "Community Outreach Services" and the following:

    1. Develop a contact list of community, tenants, property owners, and agencies with a stake in the project.

    2. Prepare and present of materials in coordination with the Resident Engineer.

    3. Respond to community questions and complaints related to your activities.

    4. Write, edit, update, or produce brochures, pamphlets, and news releases.

    5. Provide standard telephone inquiries and e-mail responses.

        a) Respond to telephone calls and e-mails from the public.

        b) Record calls and e-mails on to the City's internal public contact tracking system.

    6. Provide a monthly summary report of all inquiries and complaints, including the name of the person, source of inquiry (via information line or email), phone number, address, date, and time of inquiry, who responded, and a summary of resolutions or pending resolutions to the Resident Engineer.

    7. Report Exclusive Community Liaison activities at all progress meetings scheduled by the Resident Engineer.

    8. Attendance at Pre-construction, community and stakeholders meetings.

7-16.3.1 Exclusive Community Liaison Work Plan. The Work plan for the Exclusive Community Liaison shall address the items of Work specified in these specifications. Present your Exclusive Community Liaison and submit your exclusive community outreach plan in writing within 15 Days of the Award of the Contract.

7-16.4 Payment.

1. The payment for the community outreach services shall be included in the Contract Price.

2. The payment for the exclusive community liaison services shall be included in the Bid item for "Exclusive Community Liaison Services".

7-17 **NEWSLETTER.** To the City Supplement, ADD the following:

You must provide the following information:

Contractor Public Information staff shall write and publish a quarterly project newsletter of not less than 2 pages and include at least 1 picture of project progress; and include milestones anticipated to be completed in the following quarter.

7-20 **ELECTRONIC COMMUNICATION.** ADD the following:

Virtual Project Manager will be used on this contract.

SECTION 8 - FACILITIES FOR AGENCY PERSONNEL

8-2 **FIELD OFFICE FACILITIES.** To the City Supplement, ADD the following.

1. Provide a Class "A" Field Office.

SECTION 9 - MEASUREMENT AND PAYMENT

9-3.2 **Partial and Final Payment.** DELETE paragraph three in its entirety and SUBSTITUTE with the following:

Upon commencement of the Work, an escrow account shall be established in a financial institution chosen by you and approved by the City. Documentation for an escrow payment shall have an escrow agreement signed by you, the City, and the escrow agent. From each progress payment, no less than 5% will be deducted and deposited by the City into the escrow account. Upon completion of the Contract, the City will notify the Escrow agent in writing to release the funds to you. Only the designated representative of the City shall sign the request for the release of Escrow funds.

9-3.2.5 **Withholding of Payment.** To the City Supplement, item i), DELETE in its entirety and SUBSTITUTE with the following:

i) Your failure to comply with 7-2.3, "PAYROLL RECORDS" and 2-16, "CONTRACTOR REGISTRATION AND ELECTRONIC REPORTING SYSTEM."

ADD:

9-3.7 **Compensation Adjustments for Price Index Fluctuations.** To the City Supplement, subsection c), item 2, DELETE in its entirety and SUBSTITUTE with the following:

2) In the event of an overrun of Contract time, adjustment in compensation for asphalt binder included in estimates during the overrun period shall be determined using the California Statewide Crude Oil Price Index in effect on the first business day of the month within the pay period in which the overrun began.

ADD the following:

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

SECTION 203 – BITUMINOUS MATERIALS

203-15 **RUBBER POLYMER MODIFIED SLURRY (RPMS).** To the City Supplement, CORRECT section numbering as follows:

OLD SECTION NUMBER	TITLE	NEW SECTION NUMBER
203-15	RUBBER POLYMER MODIFIED SLURRY (RPMS)	203-16
203-15.1	General	203-16.1
203-15.2	Materials	203-16.2
203-15.3	Composition and Grading	203-16.3
203-15.4	Mix Design	203-16.4

ADD the following:

RPMS shall be used on this contract.

SECTION 207 – PIPE

207-9.2.3 **Fittings. To the City Supplement,** ADD the following:

8. Flange gaskets shall be 3.2mm (1/8") thick acrylic or aramid fibers bound with nitrile for all sizes of pipe. Gaskets shall be full-face type with pre-punched holes free of asbestos material. All insulating flange kits require full face gaskets.

207-9.2.4 **Lining and Coating.** To the City Supplement, Item 4, DELETE in its entirety and SUBSTITUTE with the following:

4. The fitting shall be lined with cement mortar and tar (seal) in accordance with AWWA C104/A21.4. The interior of bells shall be lined. The Contractor shall provide double thickness lining and shall use cement conforming to ASTM C150 Type II. Coating on Interior bells shall be holiday free.

207-9.2.6 **Polyethylene Encasement for External Corrosion Protection.** To the City Supplement, DELETE in its entirety and ADD the following:

When soils have been determined to be mildly corrosive through resistivity testing as specified in the City of San Diego Sewer and Water Design Guides, The outside surfaces of ductile iron pipe and fittings for general use shall be coated with bituminous coating 1 mil (25um) thick in accordance with AWWA C151 or AWWA C110. Polyethylene encasement shall be provided in accordance with AWWA C105.

207-17.2.3 **Pipe Manufacturer.** To the City Supplement, DELETE in its entirety and SUBSTITUTE with the following:

PVC products, 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.

207-26.4 **Butterfly Valves.** To the City Supplement, Paragraph (2), DELETE the last sentence.

To the City Supplement, Paragraph (3,) DELETE in its entirety and SUBSTITUTE with the following:

3. The operator shall be manual with a 2" (50 mm) square operating nut, and shall open the valve when turned counterclockwise.

SECTION 209 – STREET LIGHTING AND TRAFFIC SIGNAL MATERIALS

209-6.4 **Induction Cobra Head Luminaire.** To the City Supplement, CORRECT certain section numbering as follows:

OLD SECTION NUMBER	TITLE	NEW SECTION NUMBER
209-6.4.7	Luminaire Identification	209-6.4.8
209-6.4.8	Photometric Documentation	209-6.4.9
209-6.4.9	Quality Assurance	209-6.4.10

SECTION 212 - LANDSCAPE AND IRRIGATION MATERIALS

212-1.2.4 Organic Soil Amendment. ADD the following:

Type 4 organic soil amendment (compost) shall be derived from Green Material (yard waste and/or food waste) that is composted in accordance with California Code of Regulations, Title 14, Chapter 3 Article 7, 17868.3 (15-day Process to Further Reduce Pathogens and kill weed and other seeds). Incorporated into the soil, compost improves soil texture; increases both nutrient and water holding capacity; and reduces the need for commercial fertilizer. Where applicable, Organic Soil Amendment can qualify as a component of LEED certification.

Type 4 organic soil amendment must come from a compost facility that tests its compost on a quarterly basis and meets the requirements listed in Table 212-1.2.4(B). Contractor shall provide a copy of the most recent quarterly test results, and a current representative sample of the compost to be used on the project, to the City, prior to approval and the compost being used.

The City of San Diego's Miramar Greenery produces Type 4 organic soil amendment (compost) and complies with the U.S. Composting Council's Seal of Testing Assurance Program. The Miramar Greenery is located within the City's Miramar Landfill at State Hwy. 52 and Convoy St. in San Diego.

http://www.sandiego.gov/environmental-services/miramar/greenery/

Table 212-1.2.4 (B)

Test Criteria	Acceptable Range	Unit of Measure	TMCC Test Method
pH	6.0 - 8.0		04.11-A 1:5 Slurry pH
Soluble salts	0 - 10	dS/m (mmhos/cm)	04.10-A 1:5 Slurry Method
Organic Matter	30 - 75%	% dry weight basis	05.07-A Loss-on-ignition Organic Matter Method (LOI)
Stability	≤ 8	mg CO_2/g OM/day	05.08-B carbon Dioxide Evolution Rate
Maturity	> 80% emergence	average % of control	05.05-A Germination and vigor

Test Criteria	Acceptable Range	Unit of Measure	TMCC Test Method
Pathogens			
Fecal coliform	Pass	Pass/Fail per U.S. EPA Class A standard, 40CFR 503.32(a)	07.01-B Fecal coliforms
Salmonella	Pass	Pass/Fail per U.S. EPA Class A standard, 40CFR 503.32(a)	07.02 Salmonella
Heavy Metal	Pass	Pass/Fail per U.S. EPA Class A standard, 40CFR 503.13(a) Tables 1 and 3.	04.06-Heavy Metals standards, and Hazardous Elements.
Particle Size	≥ 90%	% dry weight passing through 11mm	02.02-B Sample Sieving for Aggregate Size Classification

ADD:

212-3.2.2.3 **Trench Marker Tape.** To the City Supplement, DELETE in its entirety and SUBSTITUTE with the following:

1. Trench marker tape shall be installed in accordance with Standard Drawing SDM-105, "Warning/Identification Tape Installation".

ADD:

212-4 **BIORETENTION SOIL MEDIA (BSM).**

212-4.1 **General.** Bioretention Soil Media (BSM) is a formulated planting soil which consists of 70% to 80% washed sand and 20% to 30% compost on a volume basis, and shall be mixed at the plant site prior to delivery.

212-4.1.1 **Sand for Bioretention Soil Media.** The sand shall conform to ASTM C33 and a sieve analysis shall be performed in accordance with ASTM C 136 to demonstrate compliance with the gradation limits shown in Table 212-4.1.1 (A). The sand shall be thoroughly washed to remove fines, dust, and deleterious materials prior to delivery.

Table 212-4.1.1 (A) Sand Gradation Limits

Sieve Size (ASTM D422)	Percent Passing (by weight)	
	Minimum	Maximum
3/8 inch	100	100
#4	95	100
#8	80	100
#16	50	85
#30	25	60
#50	5	30
#100	0	10
#200	0	5

Note: Coefficient of Uniformity (Cu = D60/D10) equal to or greater than 4

212-4.1.2 **Compost.** Compost shall be certified by the U.S. Composting Council's Seal of Testing Assurance Program or an approved equal. Compost shall comply with the following requirements:

1. Organic Material Content shall be 35% to 75% by dry weight.
2. Physical contaminants (manmade inert materials) shall not exceed 1% by dry weight
3. pH shall be between 6.0 and 8.0
4. Soluble Salt Concentration less than 10 dS/m (Method TMECC 4.10-A, USDA and U.S. Composting Council)
5. Maturity (seed emergence and seedling vigor): greater than 80% relative to positive control (Method TMECC 5.05-A, USDA and U.S. Composting Council)
6. Stability (Carbon Dioxide evolution rate): less than 8 mg CO2-C per g OM per day (Method TMECC 5.08-B, USDA and U.S. Composting Council)
7. Moisture: 40%-50% wet weight basis.
8. Select Pathogens: Pass US EPA Class A standard, 40 CFR Section 503.32(a).
9. Trace Metals: Pass US EPA Class A standard, 40 CFR Section 503.13, Tables 1 and 3.

10. Within gradation limits in Table 212-4.1.2 (ASTM D 422 sieve analysis or approved equivalent)

Table 212-4.1.2 (A) Compost Gradation Limits

Sieve Size	Percent Passing (by weight)
1 inch	99 to 100
½ inch	90 to 100
¼ inch	40 to 90
No. 200	2 to 10

212-4.2 **Agricultural Suitability.** The Contractor shall submit the source and location of BSM, a physical sample, and accompanying and current test results by a third party independent agronomic laboratory reflecting compliance with Contract Documents to the Engineer at least 30 Days prior to ordering materials.

No planting shall begin until test results confirm the agricultural suitability of the BSM. The Contractor shall submit a written request for approval which shall be accompanied by written analysis results from a written report of a testing agency registered by the State for agricultural soil evaluation which indicates compliance which states that the tested material proposed source complies with these specifications. Third party independent laboratory tests shall be paid for by the Contractor.

212.4.2.1 **BSM Agricultural Suitability.** The BSM shall be suitable to sustain the growth of the plants specified and shall conform to the following requirements:

1. pH range: 6.0-7.8
2. Salinity less than 3.0 millimho/cm (electrical conductivity)
3. Sodium adsorption ration (SAR) less than 3.0
4. Chloride less than 150 ppm

The test results shall show the following information:

1. Date of Testing
2. Project Name
3. The Contractor's Name

4. Source of Materials and Supplier's Name
5. Estimate of Quantity Needed
6. pH
7. EC
8. Elements: phosphorus, potassium, iron, manganese, zinc, copper, boron, calcium, magnesium, sodium, sulfur, molybdenum, nickel, aluminum, arsenic, barium, cadmium, chromium, cobalt, lead, lithium, mercury, selenium, silver, strontium, tin, and vanadium
9. Soil adsorption ratio
10. Carbon/nitrogen ratio
11. Moisture content
12. Organic Content
13. An assessment of agricultural suitability based on test results
14. Recommendations for adding amendments, chemical corrections, or both.

BSM which requires amending to comply with these specifications shall be uniformly blended prior to importation. Third party independent laboratory test results reflecting compliance with above requirements shall be provided to the Engineer prior to the delivery of the BSM.

212-4.3 **Delivery, Storage and Handling.** The Contractor shall not deliver or place soils in frozen, wet, or muddy conditions.

The Contractor shall protect soils and mixes from absorbing excess water and from erosion at all times. The Contractor shall not store materials unprotected from large rainfall events. The Contractor shall not allow excess water to enter site prior to compaction. If water is introduced into the material after grading, the Contractor shall allow material to drain or aerate to optimum compaction moisture content.

212-4.4 **Quality Control and Acceptance.** Close adherence to the material quality controls herein are necessary in order to assure sufficient permeability to infiltrate runoff at a minimum rate of 5 inches per hour during the life of the facility, and to support healthy vegetation. Amendments may be included to adjust agronomic properties. Acceptance of the material will be based on test results conducted no more than 120 days prior to delivery of the blended BSM to the project site and certified to be representative. For projects installing more than 100 cubic yards of BSM, batch-specific tests of components and blended mix are required and locations of material batches shall be provided to the Engineer.

SECTION 300 – EARTHWORK

300-1.4 **Payment.** To the City Supplement, paragraph (2), DELETE in its entirety and SUBSTITUTE with the following:

2. Payment for existing pavement removal and disposal of up to 12" thick, within the excavation e.g., trench limits, shall be included in the Bid item for installation of the mains or the Work item that requires pavement removal.

SECTION 302 – ROADWAY SURFACING

302-3 PREPARATORY REPAIR WORK. To the City Supplement, DELETE in its entirety and SUBSTITUTE with the following:

302-3 PREPARATORY REPAIR WORK.

1. Prior to the placement of asphalt concrete or the application of slurry, you shall complete all necessary preparation and repair Work to the road segment.

2. Unless otherwise specified, preparatory Work shall include tree trimming, weed spray, weed abatement, crack sealing, asphalt repair, mill and pave, hump removal, miscellaneous asphalt patching, removal of raised pavement markers, and removal of pavement markings.

3. You shall repair areas of distressed asphalt concrete pavement by milling or removing damaged areas of pavement to a minimum depth of 2 inches (50.8 mm) for residential streets and a minimum depth of 3 inches (76.2 mm) for all others to expose firm and unyielding pavement.

4. You shall prepare subgrade as needed and install a minimum of 2 inches (50.8 mm) for residential streets and a minimum of 3 inches (76.2 mm) for all other streets of compacted asphalt concrete pavement over compacted native material as directed by the Engineer.

5. If the base material is exposed in order to achieve the minimum specified depth, the material shall be compacted to 95% relative compaction (dig out). Compaction tests shall be made to ensure compliance with the specifications.

6. The Engineer shall determine when and where the test shall occur. The City will pay for the soils testing required by the Engineer which meets the required compaction. You shall reimburse the City for the cost of retesting failing compaction tests. If additional base material is required, you shall use Class 2 Aggregate Base in accordance with 200-2.2, "Crushed Aggregate Base".

7. Recycled base material shall conform to crushed miscellaneous base material in accordance with 200-2.4, "Crushed Miscellaneous Base".

8. Prior to replacing asphalt, the area shall be cleaned by removing all loose and damaged material, moisture, dirt, and other foreign matter and shall be tack coated in accordance with 302-5.4, "Tack Coat".

9. You shall install new asphalt within the repair area or for patches in accordance with 302-5, "Asphalt Concrete Pavement". Asphalt concrete shall be C2-PG 64-10 in compliance with 400-4, "Asphalt Concrete".

10. No preparatory asphalt Work shall be done when the atmospheric temperature is below 50° F (10° C) or during unsuitable weather.

11. Following the asphalt placement, you shall roll the entire area of new asphalt in both directions at least twice. The finished patch shall be level and smooth in compliance with 302-5.6.2, "Density and Smoothness". After placement and compaction of the asphalt patch, you shall seal all finished edges with a 4 inch (101.6 mm) wide continuous band of SS-1H.

12. The minimum dimensions for each individual repair shall be 4 feet by 4 feet (1.2 m by 1.2 m) and shall be subject to the following conditions:

    a) If the base material is exposed to achieve the required minimum removal thickness, the base material shall be prepared conforming to 301-1, "SUBGRADE PREPARATION".

    b) When additional base material is required, then you shall use Class 2 Aggregate Base in accordance with 200-2.2, "Crushed Aggregate Base". Recycled base material shall conform to crushed miscellaneous aggregate base material in accordance with 200-2.4, "Crushed Miscellaneous Base".

    c) You may use grinding as a method for removal of deteriorated pavement when the areas indicated for removal are large enough (a minimum of the machine drum width) and when approved by the Engineer.

    d) For both scheduled and unscheduled base repairs, failed areas may be removed by milling or by excavation provided that the edges are cut cleanly with a saw. The areas shall be cleaned and tack coated in accordance with 302-5.4, "Tack Coat" before replacing the asphalt. The areas for scheduled repairs have been marked on the street.

    e) Base Repairs with RAC. Areas where failed paving is removed either by cold milling or by excavation shall be restored to existing pavement grade with ¾ inch (19.1 mm) RAC at 8 inch (203.2 mm) depth unless otherwise directed by the Engineer. These areas have been marked on the street as "DO". The asphalt concrete shall be B3-PG 64-10 as specified in 400-4, "Asphalt Concrete". Preliminary quantities are identified in the Contract Appendix but may need to be increased and approved by the Engineer at the time of construction. Base repairs shall not exceed 15% RAP in content.

    f) Unscheduled Base Repair with RAC. If paving operations cause damage outside of your control and require additional base repair,

the areas shall be removed either by cold milling or by excavation and shall be restored to existing pavement grade with ¾ inch (19.1 mm) RAC at 8 inch (203.2 mm) depth unless otherwise directed by the Engineer. The asphalt concrete shall be B3-PG 64-10 as specified in 400-4, "Asphalt Concrete". Unscheduled base repairs shall not exceed 15% RAP.

g) A base repair is considered unscheduled when it is not identified on the pavement with a "DO" or when you are directed by the Engineer to perform a base repair for the proper placement of an asphalt overlay.

302-3.1 Asphalt Patching.

1. Asphalt patching shall consist of patching potholes, gutter-line erosions, and other low spots in the pavement that are deeper than ½ inch (12.7 mm) in accordance with 302-5.6.2, "Density and Smoothness".

2. The areas requiring patching have been identified in the Contract Documents, marked on the streets, or as directed by the Engineer. You shall identify any new areas that may require patching prior to slurry Work to ensure the smoothness and quality of the finished product.

3. You shall identify and repair any areas that may require patching prior to the placement of slurry seal for a smooth and finished product.

4. Asphalt overlay shall not be applied over deteriorating pavement. Preparatory asphalt Work shall be completed and approved by the Engineer before proceeding with asphalt overlay.

5. You shall remove distressed asphalt pavement either by saw cutting or milling to expose firm and unyielding pavement, prepare subgrade (as needed), and install compacted asphalt concrete pavement over compacted native material as directed by the Engineer.

6. Prior to replacing asphalt, the area shall be cleaned and tack coated in accordance with 302-5.4, "Tack Coat".

7. Following the asphalt placement, you shall roll the entire patch in both directions and shall cover the patch at least twice.

8. After placement and compaction of the asphalt patch, you shall seal all finished edges with a 4 inch (101.6 mm) wide continuous band of SS-1H.

9. Base repairs shall not exceed 15% RAP in content.

302-3.2 Payment.

1. The payment for the replacement of existing pavement when required shall be included in the Contract Unit Price for "Asphalt Pavement Repair" for the total area replaced and no additional payment shall be made regardless of the number and size of replacements completed. No payment shall be made for areas of over-excavation or outside trench areas in utility Works unless previously approved by the Engineer. No payment for pavement replacement will be made when the damage is due to your failure to protect existing improvements. You shall reimburse the City for the cost of retesting all failing compaction tests.

2. The areas and quantities shown on the road segments and in the appendices are given only for your aid in planning the Work and preparing Bids. The Engineer will designate the limits to be removed and these designated areas shall be considered to take precedence over the area shown in an Appendix to the Contract Documents. The quantities shown in the appendices are based on a street assessment survey and may vary.

3. At the end of each day, you shall submit to the Engineer an itemized list of the asphalt pavement repair Work completed. The list shall include the location of the Work and the exact square footage of the repair.

4. The payment for preparatory repair Work and tack coating shall be paid at the Contract Unit Price for "Asphalt Pavement Repair".

5. The payment for milling shall be included in the Bid item for "Asphalt Pavement Repair" unless Bid items for asphalt milling Work has been provided.

6. The payment for miscellaneous asphalt patching shall be included in the Contract Unit Price for the slurry Work and no additional payment shall be made, unless a Bid item for "Miscellaneous Asphalt Patching" has been provided.

302-5.1.1 Damaged AC Pavement Replacement. To the City Supplement, DELETE in its entirety.

302-5.1.2 Measurement and Payment. To the City Supplement, DELETE in its entirety.

302-5.2.1 Measurement and Payment. To the City Supplement, item c), ADD the following:

Imported Subgrade material shall be paid per bid item "Imported Backfill".

SECTION 306 – UNDERGROUND CONDUIT CONSTRUCTION

306-1 OPEN TRENCH OPERATIONS. To the City Supplement, CORRECT certain section numbering as follows:

OLD SECTION NUMBER	TITLE	NEW SECTION NUMBER
306-1.8	House Connection Sewer (Laterals) and Cleanouts	306-1.9
306-1.7.1	Payment	306-1.9.1
306-1.7.2	Sewer Lateral with Private Replumbing	306-1.9.2
306-1.7.2.1	Location	306-1.9.2.1
306-1.7.2.2	Permits	306-1.9.2.2
306-1.7.2.3	Submittals	306-1.9.2.3
306-1.7.2.4	Trenchless Construction	306-1.9.2.4
306-1.7.2.5	Payment	306-1.9.2.5
306-1.7.3.6	Private Pump Installation	306-1.9.2.6
306-1.7.3.7	Payment	306-1.9.2.7

306-1.1.1 **General.** ADD the following:

Build the Project in accordance with the water high lining phasing shown on the Plans.

When installing pipelines within the City's streets, for the following streets, the total time allowed for the completion of Work may not exceed 10 Working Days per 500' of pipeline installation:

1. All Streets in the contract.

306-1.4.5 **Water Pressure Test.** To the City Supplement, Paragraph (2), DELETE in its entirety and SUBSTITUTE with the following:

2. Pressure testing of pipe and fittings at the lowest elevation shall be performed at 150% of the specified test pressure and no less than 100% of the specified test pressure at the highest elevation.

   Specified test pressure for Class 235 pipe will be 150 psi

   Specified test pressure for Class 305 pipe will be 200 psi

   Specified test pressure for steel pipe will be 200 psi

306-1.6 **Basis of Payment for Open Trench Installations.** ADD the following:

Payment for imported backfill when the Contractor elects to import material from a source outside the project limits and when authorized by the Engineer shall be included in the Bid unit price for Imported Backfill. The price shall include the removal and disposal of unsuitable materials.

306-1.8.3 **Polyurethane Lining.** To the City Supplement, item 5, DELETE in its entirety

SECTION 308 – LANDSCAPE AND IRRIGATION INSTALLATION

ADD:

308-2.5 **Bioretention Soil Media.** Bioretention Soil Media shall be thorough mixed prior to delivery using mechanical mixing. BSM shall be lightly tamped by hand and placed in loose lifts no greater than 6" to ensure proper compaction. Compaction within the BSM area will not exceed 75% standard proctor within the designed depth of the BSM.

Machinery shall not be used in the bioretention facility to place the BSM. A conveyor or spray system shall be used for media placement in large facilities.

308-7 **GUARANTEE.** To the City Supplement, DELETE in its entirety.

308-7 **PAYMENT.** ADD the following:

Work related to tree maintenance shall be included in the Bid items as follows:

- Tree Trimming (EA)
- Root Pruning (EA)
- Root Barrier (EA)

BSM shall be measured and paid per Cubic Yard installed. The installation of the pervious backfill material as specified in the Contract Documents and as directed by the Engineer shall be included in the payment.

308-8 **PAYMENT.** To the City Supplement, DELETE in its entirety.

SECTION 701 – WATER POLLUTION CONTROL

701-11 **POST-CONSTRUCTION REQUIREMENTS.** To the City Supplement, second paragraph, ADD the following:

Comply with the following post-construction requirements:

Stenciling of curb inlets.

SECTION 702 – CONSTRUCTION AND DEMOLITION WASTE MANAGEMENT.

702-1 **General.** To the City Supplement, 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 in these specifications.

SECTION 703 – ENCOUNTERING OR RELEASING HAZARDOUS SUBSTANCES

703-20 **PAYMENT.** To the City Supplement, item 1, DELETE in its entirety and SUBSTITUTE with the following:

1. The payment for waste management shall be included in the applicable Bid items as follows:

   a) "Preparation of Hazardous Waste Management Plan and Reporting" (LS).

   b) "Monitoring of Contaminated Soil" (HR).

   c) "Testing, Sampling, Site Storage, and Handling of Soils Containing RCRA Hazardous Waste" (TON).

   d) "Loading, Transportation, and Disposal of soils containing RCRA Hazardous Waste" (TON).

   e) "Testing, Sampling, Site Storage, and Handling of Petroleum Contaminated Soil" (TON).

   f) "Loading, Transportation, and Disposal of Petroleum Contaminated Soil" (TON).

   g) "Testing, Sampling, Site Storage, and Handling of Soils Containing Non-RCRA Hazardous Waste" (TON).

   h) "Loading, Transportation, and Disposal of Soils Containing Non-RCRA Hazardous Waste" (TON).

   i) Testing, Sampling, Site Storage, Handling, Transportation, and Disposal of Containerized RCRA Hazardous Waste" (55 Gal DRUMS).

   j) "Testing, Sampling, Site Storage, Handling, Transportation, and Disposal of Containerized Non-RCRA Hazardous Waste" (55 Gal DRUMS).

   k) "Testing, Sampling, Site Storage, Handling, Transportation, and Recycling/Disposal of Universal Waste" (EACH).

   l) "Testing, Sampling, Site Storage, Handling, Transportation, and Recycling/Disposal of Regulated Waste" (TON).

   m) "Testing, Sampling, Site Storage, Handling, Transportation, and Disposal of RCRA Hazardous Waste Contamination from the Treatment of Contaminated Ground Water" (GAL).

   n) "Testing, Sampling, Site Storage, Handling, Transportation, and Disposal of Non-RCRA Hazardous Waste Contamination from the Treatment of Contaminated Ground Water" (GAL).

SECTION 705 – WATER DISCHARGES

705-1 **HYDROSTATIC DISCHARGE REQUIREMENTS.** To the City Supplement, ADD the following:

3. The discharge of hydrostatic test water and/or potable water shall not contain constituents in excess of the following:

Table 705-1 (A) Effluent Limitations

Parameter	Units	Effluent Limitations
Total Residual Chlorine	mg/L	0.1
pH	units	Within the limits of 6.0 and 9.0 at all times

4. Compliance with the effluent limitation shown in Table 705-1 (A) shall be determined based on the 90th percentile of all samples obtained during the discharge event. Non-compliance for each event will be considered separately.

705-2.6.1 **General.** Paragraph (3), CORRECT reference to Section 803 to read "Section 703."

705-2.6.3 **Community Health and Safety Plan.** To the City Supplement, DELETE in its entirety and SUBSTITUTE with the following:

705-2.6.3 **Community Health and Safety Plan.** See 703-2, "Community Health and Safety Plan."

SECTION 707 – RESOURCE DISCOVERIES

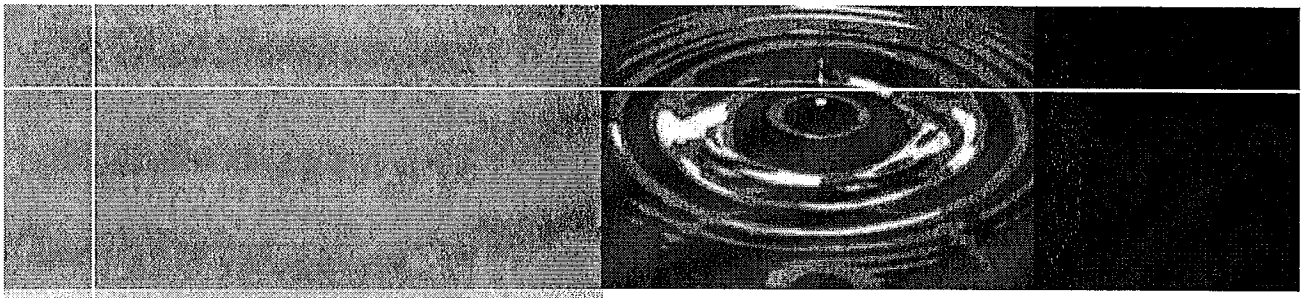
ADD:

707-1.1 **Environmental Document.** The City of San Diego Environmental Analysis Section (EAS) of the Development Services Department has prepared a **Mitigated Negative Declaration for 69th & Mohawk Pump Station, PTS No. 404973** as referenced in the Contract Appendix A. You must comply with all requirements of the **Mitigated Negative Declaration** as set forth in the Contract Appendix A.

Compliance with the City's environmental document is included in the various Bid items, unless a bid item has been provided.

END OF SUPPLEMENTARY SPECIAL PROVISIONS (SSP)

TECHNICALS



Technical Specifications

FOR

CONSTRUCTION OF

69th and Mohawk Pump Station

WBS No. S-12011

August 2016

Prepared for:

City of San Diego
Engineering and Capital Projects Department
Architectural Engineering & Parks Division And Public Utilities Department

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SECTION 01011
SUMMARY OF WORK

PART 1 GENERAL

1.01 GENERAL

A. Work to be performed under this Contract shall consist of all tools, equipment, materials, supplies, and manufactured articles. Contractor shall also furnish all labor, transportation, and services including fuel, power, essential communications, and perform all work, or other operations required for the fulfillment of the Contract in strict accordance with the Contract Documents. All work, materials, and services not expressly indicated or called for in the Contract Documents which may be necessary for the complete and proper construction of the project in good faith shall be provided by the Contractor as though originally so indicated, at no increase in cost to the City.

B. The City recommends that all bidders obtain a copy of the White Book prior to bidding. The successful bidder will be required to have a copy of the latest revision at the construction site at all times. The latest revision of the White Book is available (viewable and printable) directly from the City's website

1.02 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, Greenbook, Whitebook and other Division 01 Specification Sections, apply to this Section.

1.03 PROJECT INFORMATION

A. Project Identification: 69th and Mohawk Pump Station Project.

B. Project Location: 6910 Mohawk Street, San Diego, CA

C. City: City of San Diego

D. City's Project Manager: John Stohr

E. Engineer of Record: John H. Harris, P.E., Michael Baker International, 9755 Clairemont Mesa Blvd., San Diego, CA, 92124. Phone: (858) 614-5000.

1.04 DESCRIPTION

A. The Project is generally described as follows:

1. Base Bid

a) Construction of a new 18.0 MGD Potable Water Pump Station and associated equipment, pipelines, paving, traffic control, demolition, landscaping, community outreach and appurtenant work as indicated on the Drawings or as specified.

B. The work under this contract includes, but is not necessarily limited to, the following

C. Provide mobilization, demolition, bonds and insurance and associated project set –up and de-mobilization.

D. Construct 36-inch supply pipeline from the66-inch Mid-City pipeline to the new pump station

E. Construct the 16-inch, 24-inch and 30-inch discharge pipelines within El Cajon Blvd, 67th and 68th Streets, Mohawk street and College Grove Drive.

F. Construct the 18 MGD Pump Station and associated appurtenances.

G. Construct the 8-inch pipeline within Mohawk Street

H. Construct pedestrian ramps where indicated

I. Provide paving repairs and new striping where indicated.

J. Provide environmental mitigation and permit compliance measures.

K. Provide erosion control and WPCP services throughout the construction period.

L. Remove unsuitable soil materials and provide replacement materials as directed by the Resident Engineer.

M. Import soil materials as directed by the Resident Engineer.

N. Perform additional potholes for utilities not shown on the construction drawings as directed by the Resident Engineer.

O. Perform additional utility undercrossing

1.05 GENERAL

A. Laydown, staging, parking and material storage on site is limited. Additional laydown, staging, parking, and material storage shall be the responsibility of the contractor. The cost associated with additional staging, parking, and material storage areas shall be included in the original bid price and not additional compensation will be due to the contractor.

B. Contractor is responsible, and bid shall include, all costs required to relocate existing utilities as indicated for the successful installation of project improvements.

1.06 COORDINATION WITH SAN DIEGO GAS & ELECTRIC

A. The City has made arrangements with SDG&E to obtain permanent electrical service to the Project and has paid the corresponding fees.

B. The Contractor shall contact the SDG&E project planner for permanent electrical service utility coordination in accordance with the electric service plan provided

with the construction drawings. All costs to implement the plan shall be included in the original bid.

C. Contractor is responsible for acquiring all permits and/or approvals as needed from SDG&E. Fees paid by the Contractor for permits or service order shall be reimbursed through respective bid items.

D. Contractor shall notify SDG&E prior to beginning any trenching work for electrical power conduits.

E. SDG&E requires advance notice prior to setting the meter and transformer. It is the Contractor's responsibility to coordinate with SDG&E.

1.07 WORK BY CITY

A. General: Cooperate fully with City so work may be carried out smoothly, without interfering with or delaying work under this Contract or work by City. Coordinate the Work of this Contract with work performed by City.

B. City or its designated representative shall perform certain activities in connection with the Project with its own personnel as follows:

1. Inspection of all work indicated on the plans and specifications.

2. Operation of all existing City system valves.

3. Additional work that may require the cooperation of the Contractor in scheduling and coordination to avoid conflicts and delays.

4. Programming of the pump station PLC

1.08 ACCESS TO SITE

A. General: Contractor shall have use of Project site for construction operations as indicated on Drawings by the Contract limits and as indicated by requirements of this Section.

B. Access: It shall be the Contractor's responsibility to maintain and repair damages to the existing roads or adjoining properties that are caused by the Contractor's ingress or egress along the access route. Provide ingress and egress to buildings and properties at all times. All repairs to damaged roads or properties shall be equal to or better than the existing. The decision of the Resident Engineer as to the degree of repair to be performed will be final.

C. Use of Site: Limit use of Project site to areas within the Contract limits indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated

D. Limits: Confine construction operations to the area defined on the drawings.

1.09 COORDINATION WITH OCCUPANTS

A. City Limited Occupancy of Completed Areas of Construction: City reserves the right to occupy and to place and install equipment in completed portions of the Work, prior to Substantial Completion of the Work, provided such occupancy does not interfere with completion of the Work. Such placement of equipment and limited occupancy shall not constitute acceptance of the total Work.

B. City or Resident Engineer will prepare a Certificate of Substantial Completion for each specific portion of the Work to be occupied prior to City acceptance of the completed Work.

C. Obtain a Certificate of Occupancy from authorities having jurisdiction before limited City occupancy.

D. Before limited City occupancy, mechanical and electrical systems shall be fully operational, and required tests and inspections shall be successfully completed. On occupancy, City will operate and maintain mechanical and electrical systems serving occupied portions of Work.

E. On occupancy, City will assume responsibility for maintenance and custodial service for occupied portions of Work.

1.10 WORK RESTRICTIONS

A. Work Restrictions, General: Comply with restrictions on construction operations.

1. Comply with limitations on use of public streets and with other requirements of authorities having jurisdiction.

B. On-Site Work Hours: Limit work to working hours described in the Supplemental Special Provisions, unless access during non-working hours is prearranged with the City

1. Weekend Hours: Require City approval.

2. Early Morning Hours: None.

3. Hours for Utility Shutdowns: Schedule weekend work with City.

C. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by City or others unless permitted under the following conditions and then only after providing temporary utility services according to requirements indicated:

1. Notify City not less than three days in advance of proposed utility interruptions.

2. Obtain City's written permission before proceeding with utility interruptions.

D. Nonsmoking Building: Smoking is not permitted within the building or within 25 feet of entrances, operable windows, or outdoor-air intakes.

E. Employee Identification: Contractor will provide identification tags for Contractor personnel (including subcontractors) working on Project site. Require personnel to use identification tags at all times.

F. Employee Screening: Comply with City's requirements for drug and background screening of Contractor personnel working on Project site.

1. Maintain list of approved screened personnel with Resident Engineer.

1.11 TESTING AND INSPECTION

A. Testing and inspection will be conducted by the City and/or a City Representative. Testing will encompass: geotechnical testing and material testing. It shall be the Contractor's responsibility to assist in performing tests and inspections, and provide all labor, material, tools and equipment to facilitate testing activities. The cost of field testing will be paid for by the City, except the cost of all retesting, including City labor will be deducted from the progress payment due the Contractor.

B. The City will either perform all soils testing or obtain the services of a soil testing laboratory to test and report upon the compaction test results. Should the compaction methods used fail to achieve the required degree of compaction, the Contractor shall revise his methods to achieve the required compaction, unless otherwise directed by the Resident Engineer. Such re-work shall be included in the original contract price and no additional compensation will be allowed.

1.12 SPECIFICATION AND DRAWING CONVENTIONS

A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:

1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.

2. Specification requirements are to be performed by Contractor unless specifically stated otherwise.

B. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.

C. Drawing Coordination: Requirements for materials and products identified on Drawings are described in detail in the Specifications. One or more of the following are used on Drawings to identify materials and products:

1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.

2. Abbreviations: Materials and products are identified by abbreviations scheduled on Drawings.

3. Keynoting: Materials and products are identified by reference keynotes referencing Specification Section numbers found in this Project Manual.

1.13 STAGING AREAS

A. The Contractor shall locate all staging and lay down areas that he may require for the performance of the work. Other than staging areas designated on the Plans, the City has not identified nor acquired any staging areas for the Contractor to stockpile material, locate a job site trailer, maintain equipment from, or perform any of the activities required to complete the work required for this project.

1. Contractor shall provide and maintain a 6-foot high temporary chain link fence with visual screening fabric around staging/laydown areas.

B. If the Contractor elects to utilize an off-site staging area then the off-site staging area must be approved by the City. The Contractor shall demonstrate to the City that the selected off-site staging area is a totally disturbed site (i.e. previously graded with no vegetation, paved, gravel/asphalt area) and its use would not result in any impacts to sensitive biological or cultural resources.

1.14 NOISE CONTROL REQUIREMENTS:

A. Refer to the requirements of the White Book and other City ordinances.

1.15 ENVIRONMENTAL CONTROLS

A. The Contractor shall take specific measures to comply with all applicable environmental regulations and environmental permit requirements. Mitigation requirements include those contained in the Mitigated Negative Declaration, amendments and supplements, and all permit conditions applicable to construction of the project.

B. The Contractor shall coordinate with the City's noise and air quality monitors who will be monitoring construction operations. The Contractor shall coordinate and cooperate with individuals and firms retained by the City to monitor construction activities for environmental compliance. The lack of cooperation by Contractor to City's monitors, project environmental controls and permits may result in shutdown of activity by the Resident Engineer until the issue is resolved.

C. The referenced permits and their requirements are made a part of this Contract and Contractor shall perform such work as is necessary to conduct construction operations in compliance with the conditions contained in these permits. By submitting a bid on the project, Contractor has certified that he has reviewed the conditions of the permits and can conduct his operations within those requirements

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 CONSTRUCTION TIME

A. All work shall be completed in accordance with the requirements set forth in the Contract Documents.

B. Access to the site is limited to working hours described in the Supplemental Special Provisions, unless access during non-working hours is prearranged with the City. The Contractor shall arrange non-working hours access with the City, with a minimum of 72 hours advance notice in writing.

3.02 SEQUENCING AND OPERATIONS

A. Prior to any demolition or construction activities, the contractor shall submit a construction phasing plan for City review and approval prior to commencing work. The phasing plan shall identify utility shutdown requirements for the City as well as other agencies, highlining plans and coordination with private property owners, coordination with other jurisdictions, service activation requirements with SDG&E, staging and lay-down areas (both on-site and off-site), all other major milestone activities and environmental compliance requirements. Ensure the plan includes access by Fire Department for emergencies.

B. The City will, at all times, make the decision of the appropriateness and readiness for any shutdown. The City may cancel a shutdown, up to the last minute at no additional cost to the City if:

1. The Contractor is not ready at the designated time with all required labor, materials, and equipment to perform the work.

2. In the opinion of the City, the weather will severely impact the length of the shutdown, quality of the finished work product or ability of the Contractor to perform the work.

3. City's operational personnel have determined that the shutdown is not timely due to operational circumstances or due to unforeseen circumstances.

3.03 SUMMARY OF CONSTRUCTION OUTREACH TASKS

A. The Contractor shall be responsible for immediately notifying the City of any concerns raised by businesses or residents due to the potential construction impacts. The Contractor and the City will develop a course of action to either alleviate or minimize the concern or problem.

3.04 INSTALLATION OF SPECIALIZED EQUIPMENT

A. The Contractor shall be required to install specialized equipment within the pump station building, building exterior and around the pump station site. The City shall

furnish information regarding procurement and installation to the Contractor following award of the construction contract. An allowance item for such equipment has been provided in the bid form and all costs for installation of special equipment shall be paid out of this allowance as directed by the Resident Engineer. All costs for associated conduit, junction boxes, wiring and installation of such items as indicated on the drawings shall be included in the lump sum bid for the pump station facility and shall not be paid out of the allowance bid item.

END OF SECTION

SECTION 01015
PROJECT REQUIREMENTS

1.01 PROTECTION OF EXISTING FACILITIES

A. The Contractor's attention is directed to the possible existence of pipe and other underground improvements that may or may not be shown on the Approved Plans. Once discovered, the Contractor shall preserve and protect all such improvements whether shown on the Approved Plans or not. The Contractor shall provide and install suitable safeguards, and shall be responsible for the care and protection of all existing sewer and water pipe, telephone conduit, gas mains, culverts, or other above-ground or below-ground facilities or structures which may be encountered in or near the area of work. It shall be the responsibility of the Contractor to notify each agency of jurisdiction and utility company and to make arrangements for location of facilities prior to beginning construction. In the event of damage to existing facilities during the progress of the work, such facilities shall be replaced or restored to original condition, as determined by City, at the Contractor's expense.

B. The Contractor shall be responsible for determining in advance the location, elevation, alignment and pipe type and size of all existing pipelines to which connections are to be made. Potholing to determine location will be allowed only after providing the City with three (3) day's advance notice. The Contractor is required to contact Underground Service Alert (USA) at 8-1-1 for mark-out of all utilities in the area of the work.

C. If the Contractor, either before commencing work or during the course of the work, finds any discrepancy between specifications or drawings and the physical conditions at the site of the work, Contractor shall promptly notify the City in writing of such discrepancy.

1.02 ITEMS FURNISHED BY CITY FOR INSTALLATION UNDER THIS CONTRACT

A. None

1.03 RESPONSIBILITY FOR MATERIALS AND EQUIPMENT

A. Items Furnished by City

1. Contractor's responsibility for materials and equipment furnished by City shall begin at the point of delivery on acceptance by Contractor. Contractor shall carefully examine each shipment prior to acceptance and shall reject all defective items. City reserves the right, however, to accept items rejected by Contractor and to authorize their installation in the Work.

2. Defective materials and equipment discovered after installation and prior to final acceptance of the Work, where the defect is of a nature not detectable by visual examination and other appropriate field inspection methods, shall be replaced by City, together with such additional materials

and supplies as may be necessary for their replacement. Contractor shall furnish all necessary tools, equipment, and appliances, and perform all necessary labor, for the removal and replacement of such defective items in a manner acceptable to The Resident Engineer; adjustment to the Contract Price for the costs of the removal and replacement shall be made in accordance with the Greenbook.

3. All materials and equipment furnished by City which disappear or are damaged after their acceptance by Contractor shall be replaced by and at the expense of Contractor. Replacements shall conform to the original procurement specifications.

1.04 ITEMS FURNISHED BY CONTRACTOR

A. Contractor shall be fully responsible for all materials and equipment furnished under this Contract.

1.05 OFFSITE STORAGE

A. Offsite storage arrangements shall be approved by City for all materials and equipment not incorporated into the Work but included in Applications for Payment. Such offsite storage arrangements shall be presented in writing and shall afford adequate and satisfactory security and protection. Offsite storage facilities shall be accessible to City and the Resident Engineer.

1.06 SUBSTITUTES AND "OR-EQUAL" ITEMS

A. Whenever a material or article is specified or described by using the name of a proprietary product or the name of a particular manufacturer or vendor, the specified item shall be understood as establishing the type, function, and quality desired. Requests for review of equivalency will not be accepted from anyone except Contractor, and such requests will not be considered until after the Contract has been awarded. Other manufacturers' products may be accepted, provided sufficient information is submitted to allow Engineer to determine that the products proposed are equivalent to those named. Such items shall be submitted for review by the procedure set forth in the Submittals section.

1.07 PREPARATION FOR SHIPMENT

A. All materials shall be suitably packaged to facilitate handling and protect against damage during transit and storage. Painted surfaces shall be protected against impact, abrasion, discoloration, and other damage. All painted surfaces which are damaged prior to acceptance of equipment shall be repainted to the satisfaction of the Resident Engineer.

B. Each item, package, or bundle of material shall be tagged or marked as identified in the delivery schedule or on the Shop Drawings. Complete packing lists and bills of material shall be included with each shipment.

1.08 EASEMENTS AND RIGHTS-OF-WAY

A. The easements and rights-of-way for the pipelines will be provided by City. Contractor shall confine its construction operations within the limits indicated on the Drawings. Contractor shall use due care in placing construction tools, equipment, excavated materials, and pipeline materials and supplies in order to avoid damage to property and interference with traffic.

B. On Private Property

1. None

C. Operations in Public Right-of-Way

1. Work in public right-of-way shall be done in accordance with the requirements of the permit issued by the public agency in whose right-of-way the work is located, in addition to the requirements of the approved plans and standard specifications. If a permit is not required, the work shall conform to the standards of the public agency involved in addition to conforming to the approved plans and standard specifications.

1.09 OPERATION OF EXISTING FACILITIES

A. The existing facilities must be kept in continuous operation throughout the construction period. No interruption will be permitted which adversely affects the degree of service provided. Provided permission is obtained from City in advance, portions of the existing facilities may be taken out of service for short periods corresponding with periods of minimum service demands.

B. Contractor shall provide temporary facilities and make temporary modifications as necessary to keep the existing facilities in operation during the construction period.

1.10 NOTICES TO OWNERS AND AUTHORITIES

A. Contractor shall, as provided in the Greenbook, notify owners of adjacent property and utilities when prosecution of the Work may affect them.

B. When it is necessary to temporarily deny access to property, or when any utility service connection must be interrupted, Contractor shall give notices sufficiently in advance to enable the affected persons to provide for their needs. Notices shall conform to any applicable local ordinance and, whether delivered orally or in writing, shall include appropriate information concerning the interruption and instructions on how to limit inconvenience caused thereby.

C. Utilities and other concerned agencies shall be notified at least 72 hours, or as stipulated in the Whitebook if more restrictive, prior to cutting or closing streets or other traffic areas or excavating near underground utilities or pole lines.

1.11 CONNECTIONS TO EXISTING FACILITIES

A. Unless otherwise specified or indicated, Contractor shall make all necessary connections to existing facilities, including structures, drain lines, and utilities such as water, sewer, gas, telephone, and electric. In each case, Contractor shall receive permission from City or the owning utility prior to undertaking connections. Contractor shall protect facilities against deleterious substances and damage.

B. Connections to existing facilities which are in service shall be thoroughly planned in advance, and all required equipment, materials, and labor shall be on hand at the time of undertaking the connections. Work shall proceed continuously (around the clock) if necessary to complete connections in the minimum time. Operation of valves or other appurtenances on existing utilities, when required, shall be by or under the direct supervision of the owning utility.

1.12 SHUTDOWNS

A. Shutdowns of existing facilities will be required to complete all work shown on the drawings.

B. The Contractor shall be advised that if directed by the City, all work associated with these shutdowns may be required to occur at night during periods of low flow demands.

C. Any proposed shutdowns must be indicated on the contractor's preliminary schedule to be submitted for review by the Resident Engineer at the Pre-Construction Conference. The actual allowable durations of the shutdowns will be determined during the preparation of the detailed construction schedule, unless otherwise noted in the Drawings and/or these Specifications.

D. The Contractor shall compile a detailed list of all items of work, which must be accomplished during any shutdown. The Contractor shall coordinate his work to minimize the required number of shutdowns by accomplishing as many tasks as possible during each shutdown period.

E. The Contractor shall make specific written requests for all shutdowns twenty (20) working days in advance of the proposed shutdown for review and approval by the Resident Engineer. The written request shall include a complete detailed plan of the contractor's proposed activities including schedule, manpower, equipment, materials and methods that will be utilized to perform the required work during the proposed shutdown.

F. Should the Resident Engineer feel that the Contractor's proposed plan is insufficient to successfully complete the required work during the shutdown period, the Contractor shall make the appropriate revisions in his proposed plan to the satisfaction of the Resident Engineer. City has right to change date and time of requested shutdown. The City also has the right to perform work associated with the shutdown. The Contractor shall credit the City for any work not performed as bid.

G. All materials and equipment (including emergency equipment) necessary to expedite the tie-in shall be on hand prior to the shutdown of existing services or utilities.

H. At no time shall the Contractor undertake to close off any lines or open valves or take any other action which would affect the operation of the existing system, except as specifically required by the drawings and after approval is granted by the Resident Engineer.

1.13 UNFAVORABLE CONSTRUCTION CONDITIONS

A. During unfavorable weather, wet ground, or other unsuitable construction conditions, Contractor shall confine its operations to work which will not be affected adversely by such conditions. No portion of the Work shall be constructed under conditions which would affect adversely the quality or efficiency thereof, unless special means or precautions are taken by Contractor to perform the Work in a proper and satisfactory manner.

1.14 CUTTING AND PATCHING

A. Contractor shall perform all cutting and patching required for the Work and as may be necessary in connection with uncovering Work for inspection or for the correction of defective Work.

B. Contractor shall perform all cutting and patching required for and in connection with the Work, including but not limited to the following:

1. Removal of improperly timed Work.

2. Removal of samples of installed materials for testing.

3. Alteration of existing facilities.

4. Installation of new Work to existing facilities.

C. Contractor shall provide all shoring, bracing, supports, and protective devices necessary to safeguard all Work and existing facilities during cutting and patching operations. Contractor shall not undertake any cutting or demolition which may affect the structural stability of the Work or existing facilities without Resident Engineer's concurrence.

D. Materials shall be cut and removed to the extent indicated on the Drawings or as required to complete the Work. Materials shall be removed in a careful manner, with no damage to adjacent facilities or materials. Materials which are not salvable shall be removed from the site by Contractor.

E. All Work and existing facilities affected by cutting operations shall be restored with new materials, or with salvaged materials acceptable to Resident Engineer, to

obtain a finished installation with the strength, appearance, and functional capacity required. If necessary, entire surfaces shall be patched and refinished.

1.15 ASBESTOS ABATEMENT

A. The work includes modifications to asbestos cement pipelines as indicated on the drawings. The Contractor shall comply with the subsections below and include all associated work in the contract price bid for the work.

B. If, during the progress of the Work, previously unidentified asbestos-containing products are encountered that require removal or modification, the Contractor shall stop work in the affected area and engage an asbestos abatement Subcontractor to verify the materials and, if necessary, encapsulate, enclose, or remove and dispose of all asbestos in accordance with current regulations of the Environmental Protection Agency and the U. S. Department of Labor - Occupational Safety and Health Administration, the state asbestos regulating agency, and any local government agency. Payment for such work shall be negotiated with the Resident Engineer and paid by Change Order.

C. Subcontractor's Qualifications

1. The Subcontractor for asbestos abatement shall be regularly engaged in this type of activity and shall be familiar with the regulations which govern this work. The Subcontractor shall demonstrate to the satisfaction of City that it has successfully completed at least three asbestos abatement projects that it has the necessary staff and equipment to perform the work, and that it has an approved site for disposal of the asbestos. Liability insurance covering the asbestos abatement work shall be provided as specified in the Supplementary Special Provisions.

D. Abatement Methods

1. The asbestos abatement Subcontractor shall submit a work plan of its proposed abatement procedure to City before beginning work and shall certify that the methods are in full compliance with the governing regulations. The work plan shall cover all aspects of the abatement, including health and safety of employees and building occupants, hygiene facilities, employee certification, clearance criteria, transportation and disposal, enclosure techniques, and other techniques appropriate for the proposed work.

1.16 HAZARDOUS WASTE AND UNKNOWN PHYSICAL CONDITONS

A. If conditions listed below are found during construction, or if any other conditions are found during construction that may be detrimental to the City's facilities being constructed, or to the health and safety of the public, the Contractor shall promptly notify the City.

1. Material that the Contractor or Resident Engineer believes may be hazardous waste, as defined in Section 25117 of the Health and Safety Code, and is thus required to be removed to a Class I, Class II, or Class III disposal site in accordance with the provisions of existing law. If such material is discovered, the Contractor shall immediately cease work and shall not disturb the job site except as required to protect public safety.

2. Subsurface or latent physical conditions at the site differ from those indicated.

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

B. The Contractor shall promptly inform the City of any such conditions found during construction. The City shall investigate the conditions, and if it finds that the conditions do materially differ from those shown or expected, or do involve material that may be hazardous waste, Contractor shall cease work in the impacted area. If material that may be hazardous waste is discovered, the Contractor and City shall insure that the appropriate government agencies are contacted prior to any further work being performed and that a solution is implemented.

1.17 APPLICABLE CODES

A. References in the Contract Documents to local codes mean the following:

1. Current California Building Codes.

2. California Occupational Safety and Health Standards for General Industry.

3. San Diego County Department of Transportation.

4. Regional Water Quality Control Board General Construction Activity Storm Water Permit

5. National Electric Code.

6. National Fire Protection Act (NFPA)

7. San Diego Air Pollution Control City.

B. Other standard codes which apply to the Work are designated in the Specifications.

1.18 REFERENCE STANDARDS

A. Reference to standards, specifications, manuals, or codes of any technical society, organization, or association, or to the laws or regulations of any governmental authority, whether such reference be specific or by implication, shall mean the

latest standard specification, manual, code, or laws or regulations in effect at the time of opening of Bids (or on the effective date of the Contract or Agreement if there were no Bids), except as may be otherwise specifically stated in the Contract Documents. However, no provision of any referenced standard, specification, manual, or code, or any instruction of a Supplier, shall be effective to change the duties or responsibilities of City, Contractor, or Engineer of Work, or any of their subcontractors, consultants, agents, or employees from those set forth in the Contract Documents, nor shall any such provision or instruction be effective to assign to City, Engineer of Work or any of Engineer's Consultants, agents, or employees, any duty or authority to supervise or direct the performance of the Work or any duty or authority to undertake responsibility inconsistent with the provisions of the Contract Documents.

1.19 APPROVED MATERIALS LIST

A. All materials shall be made of the makes and models tested and approved for use. Selections shall be made from the current Approved Material List, where applicable. It is the Contractor's responsibility to verify that materials received for the job conform to the current Approved Materials List, where applicable, or meet the requirements of the technical specifications.

B. Products on the Approved Materials List may be disqualified at any time in the event the quality of the product is no longer judged as acceptable by the Engineer or if a higher-quality project is specified or becomes available.

1.20 SITE ADMINISTRATION

A. Contractor shall be responsible for all areas of the Site used by it and by all Subcontractors in the performance of the Work. Contractor shall exert full control over the actions of all employees and other persons with respect to the use and preservation of property and existing facilities, except such controls as may be specifically reserved to City or others. Contractor shall have the right to exclude from the Site all persons who have no purpose related to the Work or its inspection, and may require all persons on the Site (except City's employees) to observe the same regulations as Contractor requires of its employees.

1.21 SITE ACCESS

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. It shall be the Contractor's responsibility to construct and maintain, at its own expense, any haul roads required for its construction operations.

B. Comply with all rules and regulations of the City, State, and County authorities regarding closing or restricting the use of public streets or highways. No public or private road shall be closed, except by express permission of the City or the authorities with their respected jurisdiction. Contractor shall obtain all required encroachment permits at his own expense, unless noted otherwise.

C. Conduct the work so as to assure the least possible obstruction to traffic and normal commercial pursuits. Protect all obstructions within traveled roadways by installing approved signs, barricades and lights where necessary for the safety of the public. The convenience of the general public and residents, and the protection of persons and property are of prime importance and shall be provided for in an adequate and satisfactory manner.

D. Follow all detailed traffic control plans, including durations, as indicated within the Contract Documents.

1.22 SITE INVESTIGATION

A. The contractor shall visit the site of work and shall familiarize himself with all conditions that may in any manner affect his work. No allowances will be subsequently made for the failure of the contractor to have examined the site of work.

B. The contractor acknowledges that he has satisfied himself as to the nature and location of the work, the general and local conditions, particularly those bearing upon availability of transportation, access to the site, disposal, handling and storage of materials, availability of labor, water, electric power, roads, and uncertainties of weather, or similar physical conditions at the site, the character of equipment and facilities needed preliminary to and during the prosecution of the work and all other matters which can in any way affect the work or the cost thereof under the contract. No adjustment in the contract price shall be provided if on-site vegetation is taller, more dense or of different character at the time the Notice to Proceed is issued than observed during the Contractor's initial site investigation.

C. The contractor warrants that as a result of his examination and investigation of all the aforesaid data that he can perform the work in a good and workmanlike manner and to the satisfaction of the City. The City assumes no responsibility for any representations made by any of its officers or agents during or prior to the execution of the contract. Unless (1) such representations are expressly stated in the contract; and (2) the contract expressly provides that the responsibility therefore is assumed by the City.

1.23 PUBLIC RELEASE OF INFORMATION

A. There shall be no public release of information or photographs concerning any aspect of the materials or services relating to the bid, contract, or purchase order, or other documents resulting there from, without the prior written approval of the City.

1.24 POTHOLING

A. The Contractor is required to pothole all utilities within the planned construction areas prior to submittal of piping shop drawings. Potholing shall include verification of location, material and size of utilities. Any conflicts that may arise between existing utilities and the Construction Drawings shall immediately be brought to the

attention of the Resident Engineer. All discrepancies between the field conditions and the Construction Drawings shall be noted by the Contractor for use in preparing piping shop drawings and record drawings. The contract price bid shall include the cost of potholing all utility lines shown on the drawings. If utility lines are encountered via the USA Dig-Alert mark-out process or preliminary excavations, additional potholing work will be required and paid by the unit price bid for potholing utilities not shown on the drawings.

1.25 FIRE DANGER

A. Contractor shall minimize fire danger in the vicinity of and adjacent to the construction site. Provide labor and equipment to protect the surrounding private property from fire damage resulting from construction operations. All costs arising from fire or the prevention of fire shall be at the expense of the Contractor.

1.26 PUBLIC SAFETY AND TRAFFIC CONTROL

A. The Contractor shall at all times conduct operations in a manner causing the minimum obstruction and inconvenience to public traffic and shall meet the traffic control requirements as specified within the Contract Documents. The Contractor shall not interfere with the normal operation of public transit vehicles unless otherwise authorized. Open trenches and excavations shall be provided with adequate barricades in accordance with the approved traffic control plan or the requirements of the agency of jurisdiction. At night, lights shall mark all open work and obstructions. The Contractor shall install and maintain all signs, lights, flares, barricades, traffic plates, railings, runways, stairs, bridges, and other equipment necessary to safeguard the public. Safety instructions received from governmental authorities shall be followed, but compliance with such instructions shall not diminish the Contractor's responsibility or liability for accidents to workers or damage or injury to persons or property.

B. In accordance with generally accepted construction practices, the Contractor shall be solely and completely responsible for conditions of the job site, including safety of all persons and property during performance of the work, and the Contractor shall fully comply with all state, federal, and other laws, rules, regulations, and orders relating to the safety of workers and others.

C. The right of the City to conduct construction review or observation of the Contractor's performance does not include review or observation of the adequacy of the Contractor's safety measures in, on, or near the construction site.

D. The Contractor shall take immediate action to correct any condition adversely affecting public safety.

E. The Contractor shall submit a traffic control plan to the agency having jurisdiction and shall obtain approval prior to starting the work for areas where detailed traffic control plans have not been developed.

1.27 PRECONSTRUCTION CONFERENCE

A. Prior to the commencement of Work at the Site, a preconstruction conference will be held at a mutually agreed time and place. The conference shall be attended by:

1. Contractor and its superintendent.

2. Principal Subcontractors.

3. Representatives of principal Suppliers and manufacturers as appropriate.

4. Engineer of Work

5. City or City's onsite representatives.

6. Government representatives as appropriate.

7. Others as requested by Contractor, City, or Engineer of Work.

B. Unless previously submitted to City, Contractor shall bring to the conference a preliminary schedule for each of the following:

1. Progress Schedule.

2. Procurement Schedule.

3. Schedule of Values for progress payment purposes.

4. Schedule of Shop Drawings and other submittals.

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 agenda will include:

1. Contractor's preliminary schedules.

2. Transmittal, review, and distribution of Contractor's submittals.

3. Processing Applications for Payment.

4. Maintaining record documents.

5. Critical Work sequencing.

6. Field decisions and Change Orders.

7. Use of premises, office and storage areas, security, housekeeping, and City's needs.

8. Major equipment deliveries and priorities.

9. Community Outreach

10. Set up of Resident Engineer's Field Office, if needed

11. Contractor's assignments for safety and first aid.

D. City will preside at the conference and will arrange for keeping the minutes and distributing the minutes to all persons in attendance.

1.28 PROGRESS MEETINGS

A. City shall schedule and hold weekly progress meetings and at other times as requested by City or required by progress of the Work. Contractor, City staff, Engineer of Work (as needed), Resident Engineer, and all Subcontractors active on the Site shall be represented at each meeting. Contractor may at its discretion request attendance by representatives of its Suppliers, manufacturers, and other Subcontractors.

B. Resident Engineer shall preside at the meetings. Meeting minutes shall be prepared and distributed by the Resident Engineer. 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.

1.29 PAYMENT

A. The Contract Price bid in the Bid Proposal Form shall cover all Work required by the Contract Documents. All costs in connection with the proper and successful completion of the Work, including furnishing all materials, equipment, supplies, and appurtenances; providing all construction plant, equipment, and tools; and performing all necessary labor and supervision to fully complete the Work as indicated on the drawings or specified by these specifications and permit requirements, conduct start-up testing, conduct training, and provide operation and maintenance manuals and record drawings shall be included in the unit and lump sum prices bid. All Work not specifically set forth as a pay item in the Bid Form shall be considered a subsidiary obligation of Contractor and all costs in connection therewith shall be included in the prices bid. This requirement shall include all meetings and permit compliance requirements with affected utility companies and agencies with jurisdiction over the project.

B. The lump sum Pump Station Building bid item provided in the Bid Proposal Form shall be inclusive of all work required to construct the pump station facility as indicated on the drawings and specified herein, excluding any work covered by bid items listed separately. This bid item shall include all preparatory work, demolition of existing facilities and utilities, coordination between trades and other bid items, earthwork, clearing and grubbing, decorative site and retaining walls, steel fencing and gates, gate operator and controls, site drainage and water quality elements, suction and discharge piping (the limits of which are indicated on drawing C-16), flow meter vault, HVAC equipment, acoustical treatment, all architectural and

structural elements and incidental related work to make a complete functional pump station facility.

C. The lump sum Electrical and Instrumentation bid item provided in the Bid Proposal Form shall be inclusive of all work required to procure and install all electrical and instrumentation components indicated on the drawings and specified herein, excluding any work covered by bid items listed separately. This bid item shall be inclusive of all preparatory work to plan and install conduits within slabs and walls, coordination with other trades, connecting the emergency generator system, all materials, installation, and incidental related work to make a complete and functional facility in accordance local, state and national codes and standards.

D. The lump sum Emergency Gen-set Enclosure bid item provided in the Bid Proposal Form shall be inclusive of all work required to construct the emergency generator enclosure structure, including all masonry, earthwork, concrete, steel roof trellis and gates, coordination with other trades and installation of the emergency generator. All related electrical and instrumentation work to energize and activate the generator system shall be included in the Electrical and Instrumentation bid item.

END OF SECTION

SECTION 01070
ABBREVIATIONS OF TERMS AND ORGANIZATIONS

PART 1 LIST OF ABBREVIATIONS

Abbreviations for standards and organizations used in the Contract Documents are defined as follows:

AABC	Associated Air Balance Council
AAMA	Architectural Aluminum Manufacturers Association
AASHTO	American Association of State Highway and Transportation Officials
ABMA	American Boiler Manufacturers Association
ACI	American Concrete Institute
ACPA	American Concrete Pipe Association
AEIC	Association of Edison Illuminating Companies
AFBMA	Antifriction Bearing Manufacturers Association
AFPA	American Forest & Paper Association
AGA	American Gas Association
AGMA	American Gear Manufacturers Association
AHA	American Hardboard Association
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
AITC	American Institute of Timber Construction
AMCA	Air Moving and Conditioning Association
ANSI	American National Standards Institute
APA	American Plywood Association
AREMA	American Railway Engineers and Maintenance-of-Way Association
ARI	American Refrigeration Institute
ASAHC	American Society of Architectural Hardware Consultants
ASCE	American Society of Civil Engineers
ASHRAE	American Society of Heating, Refrigeration, and Air Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASSE	American Society of Sanitary Engineers
ASTM	American Society for Testing and Materials
AVATI	See RTI
AWG	American Wire Gage
AWI	Architectural Woodwork Institute
AWPA	American Wood-Preservers' Association
AWPB	American Wood Preservers Bureau
AWS	American Welding Society
AWWA	American Water Works Association
BHMA	Builders Hardware Manufacturers Association
BIA	Brick Institute of America (formerly SCPI)
CDA	Copper Development Association
CISPI	Cast Iron Soil Pipe Institute

CMAA	Crane Manufacturers Association of America
CRA	California Redwood Association
CRSI	Concrete Reinforcing Steel Institute
CS	Commercial Standard (U.S. Department of Commerce)
DHI	Door and Hardware Institute
DIPRA	Ductile Iron Pipe Research Association
EEI	Edison Electric Institute
EJCDC	Engineers' Joint Contract Documents Committee
EPA	Environmental Protection Agency
FCC	Federal Communications Commission
FCI	Fluid Controls Institute
FGMA	Flat Glass Marketing Association
FHWA	Federal Highway Administration
FIA	Factory Insurance Association
FM	Factory Mutual
FSA	Fluid Sealing Association
FTI	Facing Tile Institute
Green Book	Standard Specifications for Public Works Construction
HEI	Heat Exchange Institute
HMI	Hoist Manufacturers Institute
HPMA	Hardwood Plywood Manufacturers Association
HTI	Hand Tools Institute
I-B-R	Institute of Boiler and Radiator Manufacturers
IEEE	Institute of Electrical and Electronics Engineers
IBC	International Building Code
IES	Illuminating Engineering Society
IFI	Industrial Fasteners Institute
IPCEA	Insulated Power Cable Engineers Association
IRI	Industrial Risk Insurers
ISA	Instrumentation, Systems, and Automation Society
MHI	Materials Handling Institute
MMA	Monorail Manufacturers Association
MSS	Manufacturers Standardization Society of Valve and Fitting Industry
NAAMM	National Association of Architectural Metals Manufacturers
NBHA	National Builders Hardware Association
NBBPVI	National Board of Boiler and Pressure Vessel Inspectors
NBS	See NIST
NCSPA	National Corrugated Steel Pipe Association
NEBB	National Environmental Balancing Bureau

NEC	National Electrical Code
NECA	National Electrical Contractors Association
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association
NIST	National Institute of Standards and Technology (formerly NBS)
NLA	National Lime Association
NPC	National Plumbing Code
NPT	National Pipe Thread
NRMCA	National Ready Mixed Concrete Association
NSC	National Safety Council
NSF	NSF International (formerly National Sanitation Foundation)
NWMA	National Woodwork Manufacturers Association
OSHA	Occupational Safety and Health Administration
PCA	Portland Cement Association
PCI	Prestressed Concrete Institute
PS	Product Standard
RIS	Redwood Inspection Service
SDAPCD	San Diego Air Pollution Control District
SAE	Society of Automotive Engineers
SCPRF	Structural Clay Products Research Foundation
SDI	Steel Door Institute
SFPA	Southern Forest Products Association
SIGMA	Sealed Insulating Glass Manufacturers Association
SMA	Screen Manufacturers Association
SMACNA	Sheet Metal and Air Conditioning Contractors National Association
SPFA	Steel Plate Fabricators Association
SPI	Society of the Plastics Industry
SPTA	Southern Pressure Treaters Association
SSI	Scaffolding and Shoring Institute
SSPC	SSPC: The Society for Protective Coatings
UL	Underwriters' Laboratories
USGBC	U.S. Green Building Council
WEF	Water Environment Federation

END OF SECTION

SECTION 01084
ENVIRONMENTAL REQUIREMENTS

PART 1 GENERAL

1.01 DESCRIPTION

A. This section describes the mitigation monitoring and reporting program that are required to avoid significant effects on the environment, biological resources, cultural resources, or noise.

1.02 GENERAL

A. Any fines or payments due to violations of the performance requirements and/or mitigation measures outlined below, as a result of the activities or actions of the Contractor and/or Sub-Contractors, shall be borne by the Contractor.

B. The Contractor shall submit an environmental protection plan that describes the following:

1. Protection measures required by the Mitigation Monitoring and reporting Plan.

2. Water Pollution Control Plan or similar document describing the best management practices to be employed.

3. Noise compliance measures.

4. Work hours.

1.03 PERFORMANCE REQUIREMENTS

A. All personnel working on the project shall conform to the following requirements:

1. All vehicles shall remain on existing public right of way.

2. No plants or wildlife shall be collected.

3. No firearms are allowed.

4. Wildlife shall not be fed.

5. No pets shall be brought onto the project site.

6. Littering is strictly prohibited. All construction wastes or other litter shall be removed from work sites and properly disposed of each day.

7. Take reasonable measures to prevent unnecessary dust. Earth surfaces subject to dusting shall be kept moist with water or by application of a

chemical dust suppressant. When practicable, dusty materials in piles or in transit shall be covered to prevent blowing dust. Buildings or operating facilities which may be affected adversely by dust shall be adequately protected from dust. Existing or new machinery, motors, instrument panels, or similar equipment shall be protected by suitable dust screens. Proper ventilation shall be included with dust screens.

PART 2 MATERIALS (NOT USED)

PART 3 EXECUTION

3.01 CEQA SPECIFIC MITIGATION MEASURES

A. The City of San Diego (City) is both the project proponent and the Lead Agency under CEQA for the 69th and Mohawk Pump Station project. In its role as Lead Agency, the City is responsible for ensuring the adequacy of the Mitigated Negative Declaration/Initial Study (MND/IS) prepared for the project. A copy of the MND/IS is included in Appendix A.

B. The Contractor shall take specific measures to comply with all applicable environmental regulations, environmental permit requirements, and mitigation requirements as specified in the Whitebook and described in the Mitigation Monitoring and Reporting Plan (MMRP) that has been developed for the project. The MMRP is contained in Appendix A.

END OF SECTION

SECTION 01300
SUBMITTALS

PART 1 GENERAL

1.01 DESCRIPTION

A. Submittals include all drawings, diagrams, illustrations, schedules and other data which are specifically prepared by or for the Contractor to illustrate some portion of the Work and all illustrations, brochures, standard schedules, performance charts, instruction, diagrams and other information prepared by the manufacturer, fabricator, supplier or distributor and submitted by Contractor to illustrate material or equipment for some portion of the Work as required by the Contract Documents.

B. Where required by the Specifications, the Contractor shall submit descriptive information which will enable the City Engineer to determine whether the Contractor's proposed materials, equipment, or methods of work are in general conformance with the design concept and are in compliance with drawings and specifications. The information to be submitted shall consist of drawings, specifications, descriptive data, certificates, samples, test results and other such information, all as specifically required in the specifications.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Whitebook Section 6-1.1 Construction Schedule

1.03 CONTRACTOR'S RESPONSIBILITIES

A. The Contractor shall be responsible for the accuracy and completeness of the information contained in each submittal and shall assure that the material, equipment, or method of work shall be as described in the submittal. Submittals shall contain all required information, including satisfactory identification of items, units and assemblies in relation to the Contract Drawings and Specifications. The Contractor shall verify that the material and equipment described in each submittal conforms to the requirements of the Specifications and Drawings. Unless otherwise approved by the City Engineer, submittals shall be made only by the Contractor, who shall indicate by a signed stamp on the submittals that the Contractor has checked the submittals and that the work shown conforms to contract requirements and has been checked for dimensions and relationship with work of all other trades involved. If the information shows deviations from the Specifications or Drawings, the Contractor, by statement in writing accompanying the information shall identify the deviations and state the reason(s) therefore. The Contractor shall ensure that there is no conflict with other submittals and shall notify the City Engineer in each case where the Contractor's submittal may affect the work of another contractor or the City. The Contractor shall insure coordination

of submittals among the related crafts and subcontractors. Submittals are not acceptable directly from Subcontractors, suppliers, or manufacturers.

B. Submittal review by the City or Resident Engineer is only for general compliance with the Contract Documents, and shall not be construed as relieving the Contractor of the full responsibility for: providing materials, equipment, and work required by the Contract Documents; the proper fitting and constructions of the work; the accuracy and completeness of the submittals; selecting fabrication processes and techniques of construction; and performing the work in a safe and orderly manner.

C. Do not commence any portion of the work requiring a submittal until all the submittals and all other dimensions, quantities and materials pertinent to that portion of the work have been reviewed by the City and returned to the Contractor with the notation indicating that resubmittal is not required.

1.04 TRANSMITTAL PROCEDURE

A. General: Submittals regarding material and equipment shall be accompanied a transmittal form. The transmittal form shall be dated, signed, and sequence numbered identifying as to initial or resubmittal status, and fully describing the submittal content. A separate form shall be used for each specific item, class of material, equipment, and items specified in separate, discrete sections for which a submittal is required. However, submittals for various items shall be made with a single form only when the items taken together constitute a manufacturer's package or are so functionally related that expediency indicates checking or review of the group or package as a whole.

B. Provide on each Shop Drawing submittal the following Certification Statement, signed by the Contractor:

1. "Certification Statement: By this submittal, I hereby represent that I have determined and verified all field measurements, field construction criteria, materials, dimensions, catalog numbers and similar data and I have checked and coordinated each item with other applicable submittals and other requirements of the contract documents."

C. Submittal Identification. Assign each submittal a unique number. Clearly note the submittal numbers on the transmittal. Number each submittal with the identifying specification section, followed by a sequential number that represents the Contractor's assigned number of 01, 02, et cetera. Resubmittals shall be numbered by adding a dot (.) and 01, 02, 03, et cetera to the original submittal number, depending on the number of times the submittal has been resubmitted. For example: if Submittal 03300-01 requires a resubmittal, the first resubmittal will bear the designation "03300-01.01" and the second resubmittal will bear the designation "03300-01.02" and so on.

1. All submittals shall show the contract title, shall indicate the name of the vendor, and shall indicate when the equipment and/or material will be required by the construction schedule. The submittal must be adequate to permit a comprehensive review without further reference to the Contractor. In each submittal the Contractor shall state the Drawing numbers and Specification Sections, Articles, and paragraphs to which the submittal pertains.

D. Method of Submittal. A minimum of six (6) hard copies and one (1) electronic PDF version of all submittals and/or shop drawings shall be submitted to the Engineer for review. The submittal will be returned to Contractor for correction and changes if required. Final submittals shall consist of a minimum of six (6) hard copies and one (1) electronic PDF version for the City's permanent records. The Contractor shall make selections from the City's Approved Materials List, where possible. If selections are made from said list, the Contractor shall supply the City with one copy of the manufacturer's data for record purposes only.

E. Submittal for Materials on Approved Material List. Submittals regarding materials and equipment which are a part of the City's Approved Materials List shall be accompanied by the Materials Submittal Checklist. Contractor shall include one (1) copy of the manufacturers' catalog cut sheet for each item on the Approved Material List. This copy is for City's record keeping purposes. The City will review the Checklist to verify that the material and equipment selected conforms to the requirements of the Contract Documents. Multiple manufacturers for any item on the Approved Material List will not be allowed.

F. Shop Drawings. Each shop drawing shall be complete with respect to dimensions, design criteria, materials, connections, bases, foundations, anchors, and the like, and shall be accompanied by technical and performance data as necessary to fully illustrate the information in the shop drawings. Unless otherwise specified, each Shop Drawing shall be submitted on 24-inch x 36-inch bond paper and folded to 8-1/2 inch x 11-inch in size. If clearly legible at half-size, Shop Drawings may be submitted on 11-inch x 17-inch bond paper.

G. Samples. Unless otherwise specified, submittals requiring samples shall include two (2) sets of samples. One set of approved samples and all disapproved samples will be returned to the Contractor.

H. Deviations/Substitutions. If the Contractor proposes to provide material or equipment which does not conform to the Contract Documents, Contractor shall give notice in writing in the transmittal form of any deviation. The notice shall include, in writing, a reason for the change with the submittal, all other changes required to correlate work items and all variation in costs occasioned by the deviations and Contractor's assumption of the cost of all related changes if deviation is approved. All costs associated with proposed deviations including assembling required information requested

by the City Engineer shall be borne by the Contractor. Pertaining to Contractor's proposed Deviations, Substitutions, or "OR-EQUAL" Item

1. The burden of proof as to the type, function, and quality of any such substitution product, material or equipment shall be upon the Contractor.

2. The City will be the sole judge as to the type, function, and quality of any such substitution and the City's decision shall be final.

3. Acceptance by the City of a substitution 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 substitution.

I. Submittal Completeness. Submittals which do not have all the information required to be submitted, including deviations, shall be considered as not complying with the intent of the Contract and are not acceptable and will be returned without review.

J. Submittal Materials Quality. Submittals shall be composed of clean, legible copies of manufacturer's literature, calculations, diagrams, etc. which are pertinent to the subject of the submittal. Where literature is provided that describes various styles or different components, the portion of the literature pertinent to the subject of the submittal shall be highlighted or otherwise clearly noted.

1. Facsimiles of information shall not be acceptable as part of a submittal package. A submittal which incorporates facsimiles shall be subject to rejection.

2. Submittals which include illegible information due to poor reproduction quality or any other reason shall be subject to rejection.

1.05 REVIEW PROCEDURE

A. General: Submittal will be reviewed only for conformance with the design concept of the Project and with the information given in the Contract Documents. The approval of a separate item as such will not indicate approval of the assembly in which the item functions. The approval of submittals shall not relieve the Contractor of responsibility for any errors and omissions in the submittals or for the accuracy of dimensions and quantities, the adequacy of connections, and the proper and acceptable fitting, execution and completion of Work.

B. Review and Approval: Contractor shall allow for 20 working days for each submittal, including resubmittals. Time for review shall commence on City's receipt of submittal. No extension of the Contract Time will be authorized

because of failure to transmit submittals in advance of the Work to permit processing, including resubmittals.

C. The returned submittals shall indicate one of the following actions:

1. If the review indicates that the material, equipment, or work method is in general conformance with the design concept and complies with the Drawings and Specifications, submittal copies will be marked "NO EXCEPTIONS TAKEN". In this event, the Contractor may begin to implement the work method or incorporate the material or equipment covered by the submittal.

2. If the review indicates limited corrections are required, copies will be marked "MAKE CORRECTIONS NOTED". The Contractor may begin implementing the work method or incorporating the material and equipment covered by the submittal in accordance with the noted corrections. Where submittal information will be incorporated in Operation and Maintenance data, a corrected copy shall be provided.

3. If the review reveals that the submittal is insufficient or contains incorrect data, copies will be marked "REVISE - RESUBMIT". Except at its own risk, the Contractor shall not undertake work covered by this submittal until the submittal has been revised, resubmitted, and returned marked either "NO EXCEPTIONS TAKEN" or "MAKE CORRECTIONS NOTED".

4. If the review indicates that the material, equipment, or work method is not in general conformance with the design concept or in compliance with the Drawings and Specifications, copies of the submittal will be marked "REJECTED - RESUBMIT". Submittal with deviations which have not been identified clearly may be rejected. Except at its own risk, the Contractor shall not undertake work covered by such submittal until a new submittal is made and returned marked either "NO EXCEPTIONS TAKEN" or "MAKE CORRECTIONS NOTED".

D. Corrections and Re-submittals. Contractor shall make all required corrections and shall resubmit the required number of corrected submittals until approved. Re-submittals shall include the **ENTIRE** submittal package including all materials and dimensions. No changes shall be made by the Contractor on re-submittals other than those changes indicated on the reviewed submittal, unless such changes are clearly described in a letter accompanying the re-submittal.

1. It is considered reasonable that the Contractor shall make a complete and acceptable submittal to the Engineer by the second submission of a submittal item. The City reserves the right to

withhold monies due to the Contractor to cover additional costs of the Engineer's review beyond the second submittal.

1.06 EFFECT OF REVIEW OF CONTRACTOR'S SUBMITTAL

A. Review of drawings, methods of work, or information regarding materials or equipment the Contractor proposes to provide, shall not relieve the Contractor of its responsibility for errors therein and shall not be regarded as an assumption of risks or liability by the Resident Engineer, the City, or the Engineer, or by any other officer, employee, or subcontractor thereof, and the Contractor shall have no claim under the contract on account of the failure or partial failure, of the method of work, material, or equipment so reviewed. A mark of "NO EXCEPTIONS TAKEN" or "MAKE CORRECTIONS NOTED" shall mean that the City has no objection to the Contractor, upon its own responsibility, using the plan or method of work proposed, or providing the materials or equipment proposed.

1.07 PERMITS

A. Obtain all permits and licenses necessary in advance of performing the work. Submit a copy of all permits and licenses to the Resident Engineer prior to performing work covered under said permit or license.

B. The Contractor and all his subcontractors, vendors and service providers shall comply with the regulations as stated in each permit for the applicable portion of the work governed by the respective permit. Failure by the Contractor, its subcontractors, vendors and service providers to comply with any permit requirements may cause monetary fines or other such retribution against the City by the permit-granting agency. Permit fines or other such retribution against the City that result from the acts or negligence of the Contractor, its subcontractors, vendors and service providers shall be paid for by the Contractor by deducting from the monies due the Contractor under this Contract.

1.08 SPARE PARTS LIST

A. Furnish to the Resident Engineer five identical sets of spare parts information for all mechanical, electrical, and instrumentation equipment. Limit the spare parts list to those spare parts, which each manufacturer recommends be maintained by the City in inventory. Include on the Spare Parts List the current list price of each spare part. Indicate the name, address, telephone number, and email address of the nearest outlet of each manufacturer or supplier of spare parts to facilitate the City in ordering. Cross-reference all spare parts to the equipment numbers designated in the Contract Documents.

1.09 RECORD DRAWINGS

A. Records drawings shall be prepared in accordance with Specification Section 01720, "Field Record Drawings".

1.10 OPERATION AND MAINTENANCE (O&M) MANUALS

A. O&M Manuals shall be delivered as a separate submittal and in accordance with Specification Section 01730, "Operations and Maintenance Data".

PART 2 MATERIALS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01400
QUALITY REQUIREMENTS

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, Greenbook, Whitebook and other Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section includes administrative and procedural requirements for quality assurance and quality control.

B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.

1. Specific quality assurance and control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.

2. Specified tests, inspections, and related actions do not limit Contractor's other quality assurance and control procedures that facilitate compliance with the Contract Document requirements.

3. Requirements for Contractor to provide quality assurance and control services required by Engineer, City, Resident Engineer, or authorities having jurisdiction are not limited by provisions of this Section.

4. Specific test and inspection requirements are not specified in this Section.

1.03 DEFINITIONS

A. Quality Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.

B. Quality Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Services do not include contract enforcement activities performed by Engineer or Resident Engineer.

C. Preconstruction Testing: Tests and inspections performed specifically for Project before products and materials are incorporated into the Work, to verify performance or compliance with specified criteria.

D. Product Testing: Tests and inspections that are performed by an NRTL, an NVLAP, or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.

E. Source Quality Control Testing: Tests and inspections that are performed at the source, e.g., plant, mill, factory, or shop.

F. Field Quality Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.

G. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.

H. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.

1. Use of trade-specific terminology in referring to a trade or entity does not require that certain construction activities be performed by accredited or unionized individuals, or that requirements specified apply exclusively to specific trade(s).

1.04 CONFLICTING REQUIREMENTS

A. Referenced Standards: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer conflicting requirements that are different, but apparently equal, to Engineer and City for a decision before proceeding.

B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Resident Engineer and City for a decision before proceeding.

1.05 INFORMATIONAL SUBMITTALS

A. Contractor's Quality Control Plan: For quality assurance and quality control activities and responsibilities.

B. Qualification Data: For Contractor's quality control personnel.

C. Testing Agency Qualifications: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include

proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.

D. Schedule of Tests and Inspections: Prepare in tabular form and include the following:

1. Specification Section number and title.

2. Entity responsible for performing tests and inspections.

3. Description of test and inspection.

4. Identification of applicable standards.

5. Identification of test and inspection methods.

6. Number of tests and inspections required.

7. Time schedule or time span for tests and inspections.

8. Requirements for obtaining samples.

9. Unique characteristics of each quality control service.

1.06 CONTRACTOR'S QUALITY CONTROL PLAN

A. Quality Control Plan, General: Submit quality control plan within 10 days of Notice of Award, and not less than five days prior to preconstruction conference. Submit in format acceptable to Resident Engineer and City. Identify personnel, procedures, controls, instructions, tests, records, and forms to be used to carry out Contractor's quality assurance and quality control responsibilities. Coordinate with Contractor's construction schedule.

B. Quality Control Personnel Qualifications: Engage qualified full-time personnel trained and experienced in managing and executing quality assurance and quality control procedures similar in nature and extent to those required for Project.

C. Submittal Procedure: Describe procedures for ensuring compliance with requirements through review and management of submittal process. Indicate qualifications of personnel responsible for submittal review.

D. Testing and Inspection: In quality control plan, include a comprehensive schedule of Work requiring testing or inspection, including the following:

1. Contractor-performed tests and inspections including subcontractor-performed tests and inspections. Include required tests and inspections and Contractor-elected tests and inspections.

2. Special inspections required by authorities having jurisdiction.

3. City-performed tests and inspections indicated in the Contract Documents

E. Continuous Inspection of Workmanship: Describe process for continuous inspection during construction to identify and correct deficiencies in workmanship in addition to testing and inspection specified. Indicate types of corrective actions to be required to bring work into compliance with standards of workmanship established by Contract requirements and approved mockups.

F. Monitoring and Documentation: Maintain testing and inspection reports including log of approved and rejected results. Include work Resident Engineer or City has indicated as nonconforming or defective. Indicate corrective actions taken to bring nonconforming work into compliance with requirements. Comply with requirements of authorities having jurisdiction.

1.07 REPORTS AND DOCUMENTS

A. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Include the following:

1. Date of issue.
2. Project title and number.
3. Name, address, and telephone number of testing agency.
4. Dates and locations of samples and tests or inspections.
5. Names of individuals making tests and inspections.
6. Description of the Work and test and inspection method.
7. Identification of product and Specification Section.
8. Complete test or inspection data.
9. Test and inspection results and an interpretation of test results.
10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
12. Name and signature of laboratory inspector.
13. Recommendations on retesting and reinspecting.

B. Manufacturer's Technical Representative's Field Reports: Prepare written information documenting manufacturer's technical representative's tests and inspections specified in other Sections. Include the following:

1. Name, address, and telephone number of technical representative making report.

2. Statement on condition of substrates and their acceptability for installation of product.

3. Statement that products at Project site comply with requirements.

4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.

5. Results of operational and other tests and a statement of whether observed performance complies with requirements.

6. Statement whether conditions, products, and installation will affect warranty.

7. Other required items indicated in individual Specification Sections.

C. Factory-Authorized Service Representative's Reports: Prepare written information documenting manufacturer's factory-authorized service representative's tests and inspections specified in other Sections. Include the following:

1. Name, address, and telephone number of factory-authorized service representative making report.

2. Statement that equipment complies with requirements.

3. Results of operational and other tests and a statement of whether observed performance complies with requirements.

4. Statement whether conditions, products, and installation will affect warranty.

5. Other required items indicated in individual Specification Sections.

D. Permits, Licenses, and Certificates: For City's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

1.08 QUALITY ASSURANCE

A. General: Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.

B. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

C. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

D. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.

E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar in material, design, and extent to those indicated for this Project.

F. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E 329; and with additional qualifications specified in individual Sections; and, where required by authorities having jurisdiction, that is acceptable to authorities.

1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.

2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.

G. Manufacturer's Technical Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

H. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

I. Preconstruction Testing: Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following:

1. Contractor responsibilities include the following:

a) Provide test specimens representative of proposed products and construction.

b) Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.

c) Provide sizes and configurations of test assemblies, mockups, and laboratory mockups to adequately demonstrate capability of products to comply with performance requirements.

2. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality assurance service to Resident Engineer and City, through Resident Engineer, with copy to Contractor. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.

1.09 QUALITY CONTROL

A. City Responsibilities: Where quality control services are indicated as City's responsibility, City will engage a qualified testing agency to perform these services.

1. City will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspecting they are engaged to perform.

2. Payment for these services will be paid by the City.

3. Costs for retesting and reinspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor.

B. Contractor Responsibilities: Tests and inspections not explicitly assigned to City are Contractor's responsibility. Perform additional quality control activities required to verify that the Work complies with requirements, whether specified or not.

1. Unless otherwise indicated, provide quality control services specified and those required by authorities having jurisdiction. Perform quality control services required of Contractor by authorities having jurisdiction, whether specified or not.

2. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality control services. Contractor shall not employ same entity engaged by City, unless agreed to in writing by City.

3. Notify testing agencies at least 48 hours in advance of time when Work that requires testing or inspecting will be performed.

4. Where quality control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality control service.

5. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.

6. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.

C. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Specification Section 01300, "Submittals."

D. Manufacturer's Technical Services: Where indicated, engage a manufacturer's technical representative to observe and inspect the Work. Manufacturer's technical representative's services include participation in preinstallation conferences, examination of substrates and conditions, verification of materials, observation of Installer activities, inspection of completed portions of the Work, and submittal of written reports.

E. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.

F. Coordination: Coordinate sequence of activities to accommodate required quality assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.

1. Schedule times for tests, inspections, obtaining samples, and similar activities.

1.10 SPECIAL TESTS AND INSPECTIONS

A. Special Tests and Inspections: Contractor will engage a qualified special inspector to conduct special tests and inspections required by authorities having jurisdiction and as follows:

1. Verifying that manufacturer maintains detailed fabrication and quality control procedures and reviews the completeness and adequacy of those procedures to perform the Work.

2. Notifying Engineer, Resident Engineer, and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.

3. Submitting a certified written report of each test, inspection, and similar quality control service to Engineer, through Resident Engineer, with copy to Contractor and to authorities having jurisdiction.

4. Submitting a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.

5. Interpreting tests and inspections and stating in each report whether tested and inspected work complies with or deviates from the Contract Documents.

6. Retesting and reinspecting corrected work at the expense of the Contractor.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 TEST AND INSPECTION LOG

A. Test and Inspection Log: Prepare a record of tests and inspections. Include the following:

1. Date test or inspection was conducted.

2. Description of the Work tested or inspected.

3. Date test or inspection results were transmitted to Engineer and City.

4. Identification of testing agency or special inspector conducting test or inspection.

B. Maintain log at Project site. Post changes and revisions as they occur. Provide access to test and inspection log for City's, Engineer's and Resident Engineer's reference during normal working hours.

3.02 REPAIR AND PROTECTION

A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.

1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible.

B. Protect construction exposed by or for quality control service activities.

C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality control services.

SECTION 01500
TEMPORARY FACILITIES

1.01 OFFICE AT SITE OF WORK

A. During the performance of this Contract, Contractor shall maintain a suitable office at the Site which shall be the headquarters of its representative authorized to receive drawings, instructions, or other communication or articles. Any communication given to the said representative or delivered at Contractor's office at the Site in the representative's absence shall be deemed to have been delivered to Contractor.

B. The Contractor's field office shall be equivalent to a Class "A" office as defined in the WhiteBook, with a conference table to accommodate 10 persons.

C. Copies of the Drawings, Specifications, and other Contract Documents shall be kept at Contractor's office at the Site and available for use at all times.

1.02 WATER

A. All water required for construction purposes shall meet the following requirements.

1. All water used on the project shall be obtained from City sources using a construction meter.

2. The construction meter and service connection shall be obtained from the City. The Contractor shall make arrangements with the City for payment of the deposit and installation of meter.

3. The Contractor shall pay for all construction water used in accordance with City's rules and regulations or the agency of jurisdiction.

4. Damage caused to the meter will be charged to the Contractor in accordance with the rules and regulations of the agency of jurisdiction.

1.03 POWER

A. Contractor shall provide all power for heating, lighting, operation of Contractor's facilities and equipment, or for any other use by Contractor. Temporary heat and lighting shall be maintained until the Work is accepted.

B. When operational, the permanent heating and ventilation system and the permanent lighting systems may be used to provide temporary heat and light.

C. Temporary heat shall be provided when the temperature falls below 50° F and as otherwise required to maintain reasonable working conditions and protect all work, materials, and equipment against damage from dampness or cold, to dry out the structure, or to maintain proper conditions for the installation and curing of materials.

D. Heating equipment and fuels shall be suitable for the particular purpose and shall include adequate safety devise. Combustion type heaters shall not be used without proper venting nor in areas where such equipment might introduce a hazard.

E. All enclosed areas shall be ventilated (using forced-draft equipment when necessary) as required to maintain proper conditions for workers and the Work and to avoid any accumulation of hazardous dust or fumes.

1.04 SANITARY FACILITIES

A. Contractor shall furnish temporary sanitary facilities at the Site, as provided herein, for the needs of all construction workers and others performing work or furnishing services on the Project.

B. Sanitary facilities shall be of reasonable capacity, properly maintained throughout the construction period, and obscured from public view to the greatest practical extent. If toilets of the chemically treated type are used, at least one toilet will be furnished for each 20 persons. Contractor shall enforce the use of such sanitary facilities by all personnel at the Site.

1.05 FENCES

A. All existing fences affected by the Work shall be maintained by Contractor until completion of the Work. Fences which interfere with construction operations shall not be relocated or dismantled until written permission is obtained from the owner of the fence, and the period the fence may be left relocated or dismantled has been agreed upon. Where fences must be maintained across the construction easement, adequate gates shall be installed. Gates shall be kept closed and locked at all times when not in use. All fencing required for construction activities shall include visual screening.

B. On completion of the Work across any tract of land, Contractor shall restore all fences to their original or to a better condition and to their original locations.

1.06 PROTECTION OF PUBLIC AND PRIVATE PROPERTY

A. Contractor shall protect, shore, brace, support, and maintain all underground pipes, conduits, drains, and other underground construction uncovered or otherwise affected by its construction operations. All pavement, surfacing, driveways, curbs, walks, buildings, utility poles, guy wires, fences, and other surface structures affected by construction operations, together with all sod and shrubs in yards, parkways, and medians, shall be restored to their original condition, whether within or outside the easement. All replacements shall be made with new materials.

B. All fire hydrants and water control valves shall be kept free from obstruction and available for use at all times.

1.07 DAMAGE TO EXISTING PROPERTY

A. Contractor will be held responsible for any damage to existing structures, Work, materials, or equipment because of his operations and shall repair or replace any damaged structures, Work, materials, or equipment to the satisfaction of, and at no additional cost to, City.

B. Contractor shall protect all existing structures and property from damage and shall provide bracing, shoring, or other work necessary for such protection.

C. Contractor shall be responsible for all damage to streets, roads, curbs, sidewalks, highways, shoulders, ditches, embankments, culverts, bridges, or other public or private property, which may be caused by transporting equipment, materials, or workers to or from the Work. Contractor shall make satisfactory and acceptable arrangements with the agency having jurisdiction over the damaged property concerning its repair or replacement.

1.08 SECURITY

A. Contractor shall be responsible for protection of the Site, and all Work, materials, equipment, and existing facilities thereon, against vandals and other unauthorized persons.

B. No Claim shall be made against City by reason of any act of an employee or trespasser, and Contractor shall make good all damage to Owner's property resulting from Contractor's failure to provide security measures as specified.

C. Security measures shall be at least equal to those usually provided by City to protect City's existing facilities during normal operation, but shall also include such additional security fencing, barricades, lighting, and other measures as required to protect the Site.

1.09 ACCESS ROADS

A. Contractor shall establish and maintain temporary access roads to various parts of the Site as required to complete the Project. Such roads shall be available for the use of all others performing work or furnishing services in connection with the Project.

1.10 PARKING

A. Contractor shall provide and maintain suitable parking areas for the use of all workers and others performing work or furnishing services in connection with the Project, as required to avoid any need for parking personal vehicles where they may interfere with public traffic, City's operations, or construction activities. Ten (10) separate parking spaces shall be provided for use by personnel and visitors at the Field Office.

1.11 NOISE CONTROL

A. Contractor shall take reasonable measures to avoid unnecessary noise. Such measures shall be appropriate for the normal ambient sound levels in the area during working hours. All construction machinery and vehicles shall be equipped with practical sound-muffling devices, and operated in a manner to cause the least noise consistent with efficient performance of the Work.

1.12 TEMPORARY DRAINAGE PROVISIONS

A. Contractor shall provide for the drainage of storm water and such water as may be applied or discharged on the Site in performance of the Work. Drainage facilities shall be adequate to prevent damage to the Work, the Site, and adjacent property.

B. Existing drainage channels and conduits shall be cleaned, enlarged, or supplemented as necessary to carry all increased runoff attributable to Contractor's operations. Dikes shall be constructed as necessary to divert increased runoff from entering adjacent property (except in natural channels), to protect City's facilities and the Work, and to direct water to drainage channels or conduits. Ponding shall be provided as necessary to prevent downstream flooding.

1.13 EROSION CONTROL

A. Contractor shall prevent erosion of soil on the Site and adjacent property resulting from its construction activities. Effective measures shall be initiated prior to the commencement of clearing, grading, excavation, or other operation that will disturb the natural protection.

B. Work shall be scheduled to expose areas subject to erosion for the shortest possible time, and natural vegetation shall be preserved to the greatest extent practicable. Temporary storage and construction buildings shall be located, and construction traffic routed, to minimize erosion. Temporary fast-growing vegetation or other suitable ground cover shall be provided as necessary to control runoff. The Contractor's WPCP shall include erosion control measures for temporary facilities.

1.14 POLLUTION CONTROL

A. Contractor shall prevent the pollution of drains and watercourses by sanitary wastes, sediment, debris, and other substances resulting from construction activities. No sanitary wastes shall be permitted to enter any drain or watercourse other than sanitary sewers. No sediment, debris, or other substance shall be permitted to enter sanitary sewers, and reasonable measures shall be taken to prevent such materials from entering any drain or watercourse.

1.15 WASTE DISPOSAL

A. Contractor shall provide weekly disposal and recycling services during the Project. Included therein shall be waste disposal and recycling of all materials from the

Contractor and Engineer Field Offices as required by Specification Section 01085, "Construction Waste Management and Disposal".

1.16 EXPENSES

A. The bid form doesn't include dedicated line items for the temporary facilities and controls defined in this Section. All expenses for the items listed in this section shall be included in other items shown in the bid form and no additional compensation will be allowed.

END OF SECTION

SECTION 01520
SITE SECURITY

PART 1 GENERAL

1.01 DESCRIPTION

A. This section describes the Contractor's responsibility for the security of the work site, existing facilities, off-site storage, and Contractor's tools and equipment.

1.02 REQUIREMENTS

A. The Contractor shall safely guard all work, materials, equipment, and property from loss, theft, damage, and vandalism. Contractors' duty to safely guard property shall include the City's property and other private property from injury or loss in connection with the performance of the Work.

B. Security for any off-site storage of equipment and materials is the responsibility of the Contractor.

C. The Contractor shall provide the City a list of assigned field personnel and driver's license numbers to ensure security of the City facilities.

D. The Contractor shall employ watchmen as needed to provide the required security and prevent unauthorized entry.

E. The Contractor may make no claim against the City for damage resulting from trespass.

F. The party responsible for security shall fix and return to original condition all damage to property of the City and others resulting from failure to provide adequate security.

G. If existing fencing or barriers are breached or removed for the purposes of construction, the Contractor shall provide and maintain temporary security fencing equal to the existing in a manner satisfactory to the City Engineer.

H. Security measures taken by the Contractor shall be at least equal to those typically provided by the City to protect the existing facilities during normal operation.

I. A security program shall be maintained throughout construction until final acceptance and occupancy precludes need for Contractors' security program.

J. Contractor shall provide its field personnel with identifiable uniforms when on City property.

K. The City will not take any responsibility for missing or damaged equipment, tools, or personal belongings.

PART 2 MATERIALS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01530
PROTECTION OF EXISTING FACILITIES

PART 1 GENERAL

1.01 DESCRIPTION

A. This section describes the procedures for locating, protecting, and relocating existing underground utilities and surface improvements.

1.02 GENERAL REQUIREMENTS

A. The Contractor shall protect all existing utilities, trees 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 the requirements of the Contract Documents.

B. The Contractor shall not perform work that would affect any gas, sewer, or water pipeline; any telephone or electric transmission line; any fence; or any other structure, nor shall the Contractor enter upon the rights-of-way involved until authorization has been obtained from the owner of the improvement. 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.

1.03 UNDERGROUND SERVICE ALERT

A. Except in an emergency, contact Underground Service Alert at least 2 working days, but not more than 14 calendar days, prior to commencing any excavation and obtain an inquiry identification number from that notification center. Do not commence excavation without a current inquiry identification number assigned to the Contractor or any subcontractor of the Contractor and until the Resident Engineer has been given the number by the Contractor. Comply with all applicable laws and regulations in locating subsurface installations and in excavating.

1. An emergency is defined as a sudden, unexpected occurrence, involving a clear and imminent danger, demanding immediate action to prevent or mitigate loss of, or damage to, life, health, property, or essential public services. An emergency includes such occurrences as fire, flood, earthquake, or other soil or geologic movements, as well as such occurrences as riot, accident, or sabotage.

2. Subsurface installations means any underground pipeline, conduit, duct, wire, or other structure operated or maintained in or across a public or private street or right-of-way (Government Code Section 4216).

1.04 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.

1. No excavations were made to verify the locations shown for underground utilities, unless specifically stated in the Contract Documents. The service connections to these utilities are not shown on the Plans, and the locating of such service connections is the responsibility of the Contractor.

2. Contractor shall maintain flow of all sewers, drains, or water courses, during the progress of the work, and shall restore any drains or water courses disturbed or damaged during the execution of the work to the satisfaction of City.

B. Exploratory Excavations: The Engineer has endeavored to determine the existence of utilities at the site of the work from the records of the owners of known utilities in the vicinity of the work. The positions of these utilities as derived from such records are shown on the plans. The service connections to these utilities may not be shown on the plans.

1. Prior to commencing any excavations for new pipelines or structures, the Contractor shall make his own investigations, including exploratory excavations and borings, to determine the locations and type of existing service laterals or appurtenances when their presence can be inferred from the presence of other visible facilities, such as buildings, meter and junction boxes, on or adjacent to the site of the work. If the Contractor discovers utility facilities not identified in the plans or specifications or in a position different from that shown in the plans and specifications, he shall immediately notify in writing the Resident Engineer and the owner of the utility facility.

2. The number of exploratory excavations required shall be that number which is sufficient to determine the alignment and grade of the utility. Conform to local agency requirements for backfill and pavement repair subsequent to performing exploratory excavations.

3. Potholing / location of utilities shall include excavation, visual observation, setting witness points, backfill, patching, and written documentation (including photos) of depths and location of the utility. Witness points shall be surveyed and tied to established control points.

C. Owner's Right of Access: The right is reserved to governmental agencies and owners of utilities to enter at any time upon any street, right-of-way, or easement for the purpose of making changes in their property made necessary by the work and for the purpose of maintaining and making repairs to their property.

D. 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.

E. 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.

F. All costs of locating, and 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 or such utility facilities, and which was necessarily idled during such work will be paid for as extra work.

1.05 PROTECTION OF STREET/ROADWAY MARKERS AND MONUMENTS

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 commence 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.

B. Contractor shall preserve all bench marks, monuments, survey marks, and stakes, and in case of their removal or destruction by him or his employees, he shall be liable for the cost of their replacement.

1.06 APPROVAL OF REPAIRS

A. All repairs to a damaged utility or improvement are subject to inspection and written approval by an authorized representative of the utility or improvement owner before being concealed by backfill or other work.

1.07 MAINTAINING IN SERVICE

A. 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 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.

1.08 NOTIFICATION BY THE CONTRACTOR

A. Prior to commencing any excavation in the vicinity of any existing underground facilities, the Contractor shall notify the respective authorities representing the owners or agencies responsible for such facilities not less than 3 days nor more than 14 days prior to excavation so that a representative of said owners or agencies can be present during such work if they so desire.

PART 2 PART 2 - MATERIALS (NOT USED)

PART 3 PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01612
SHIPPING

1.01 SCOPE

A. This section covers packaging and shipping of materials and equipment.

1.02 PREPARATION FOR SHIPMENT

A. All equipment shall be suitably packaged to facilitate handling and to protect against damage during transit and storage. All equipment shall be boxed, crated, or otherwise completely enclosed and protected during shipment, handling, and storage. All equipment shall be protected from exposure to the elements and shall be kept dry at all times.

B. Painted and coated surfaces shall be protected against impact, abrasion, discoloration, and other damage. Painted and coated surfaces which are damaged prior to acceptance of equipment shall be repaired in accordance with the painting/coating manufacturer's recommendation(s) and to the satisfaction of the City. Contractor shall provide the City with photos of any and all repairs.

C. Grease and lubricating oil shall be applied to all bearings and similar items.

1.03 SHIPPING

A. Before shipping each item of equipment shall be tagged or marked as identified in the delivery schedule or on the Shop Drawings. Complete packing lists and bills of material shall be included with each shipment.

END OF SECTION

SECTION 01614
HANDLING AND STORAGE

1.01 SCOPE

A. This section covers delivery, storage, and handling of materials and equipment.

1.02 DELIVERY

A. Contractor shall bear the responsibility for delivery of equipment, spare parts, special tools, and materials to the site and shall comply with the requirements specified herein and shall provide required information concerning the shipment and delivery of the materials specified in this Contract. These requirements also apply to any subsuppliers making direct shipments to the jobsite.

B. Contractor shall, either directly or through contractual arrangements with others, accept responsibility for the safe handling and protection of the equipment and materials furnished under this Contract before and after receipt at the port of entry. Acceptance of the equipment shall be made after it is installed, tested, placed in operation and found to comply with all the specified requirements.

C. All items shall be checked against packing lists immediately on delivery to the site for damage and for shortages. Damage and shortages shall be remedied with the minimum of delay.

D. Delivery of portions of the equipment in several individual shipments shall be subject to review of Engineer before shipment. When permitted, all such partial shipments shall be plainly marked to identify, to permit easy accumulation, and to facilitate eventual installation.

1.03 STORAGE

A. Upon delivery, all equipment and materials shall immediately be stored and protected until installed in the Work.

B. Stacked items shall be suitably protected from damage by spacers or load distributing supports that are safely arranged. No metalwork (miscellaneous steel shapes and reinforcing steel) shall be stored directly on the ground. Masonry products shall be handled and stored in a manner to prevent breakage, chipping, cracking, and spalling. Cement, lime, and similar products shall be stored off the ground on pallets and shall be covered and kept completely dry at all times. Pipe, fittings, and valves may be stored out of doors, but must be placed on wooden blocking. PVC pipe, geomembranes, plastic liner, and other plastic materials shall be stored off the ground on pallets and protected from direct sunlight.

C. Pumps, motors, electrical equipment, and all equipment with antifriction or sleeve bearings shall be stored in weathertight structures maintained at a temperature above 60°F. Electrical equipment, controls, and insulation shall be protected

against moisture and water damage. All space heaters furnished in equipment shall be connected and operated continuously.

D. Equipment having moving parts, such as gears, bearings, and seals, shall be stored fully lubricated with oil, grease, etc., unless otherwise instructed by the manufacturer. Manufacturer's storage instructions shall be carefully followed by Contractor.

E. When required by the equipment manufacturer, moving parts shall be rotated a minimum of twice a month to ensure proper lubrication and to avoid metal to metal "welding". Upon installation of the equipment, Contractor shall, at the discretion of Engineer, start the equipment at one-half load for an adequate period of time to ensure that the equipment does not deteriorate from lack of use.

F. When required by the equipment manufacturer, lubricants shall be changed upon completion of installation and as frequently as required thereafter during the period between installation and acceptance. New lubricants shall be put into the equipment by Contractor at the time of acceptance.

G. Equipment and materials shall not show any pitting, rust, decay, or other deleterious effects of storage when installed in the Work.

H. In addition to the protection specified for prolonged storage, the packaging of spare units and spare parts shall be for export packing and shall be suitable for long-term storage in a damp location. Each spare item shall be packed separately and shall be completely identified on the outside of the container.

1.04 HANDLING

A. Stored items shall be laid out to facilitate their retrieval for use in the Work. Care shall be taken when removing the equipment for use to ensure the precise piece of equipment is removed and that it is handled in a manner that does not damage the equipment.

END OF SECTION

SECTION 01620
EQUIPMENT SCHEDULES

1.01 SCOPE

A. This section consists of an equipment schedule for items for which a basic level of manufacturer's field services or operation and maintenance manuals are required, but not covered in other sections. When other sections indicate that manufacturer's field services and operation and maintenance manuals are required, the requirements shall be as specified in the other sections.

B. Specific requirements for manufacturer's field services are covered in Specification Section 01400, "Quality Requirements" and the equipment specifications.

C. Specific requirements for operation and maintenance manuals are covered in Specification Section 01730, "Operation and Maintenance Data", the individual equipment specifications and Specification Section 16900, "Controls and Instrumentation".

1.02 SCHEDULE

A. Manufacturer's field services, including equipment installation checks and training, and operation and maintenance manuals shall be provided for the items of equipment indicated in the following schedule:

Spec Section	Type of Equipment	Mfr's Field Services	O&M Manual
02835	Steel Roll Gate System		Yes
11205	Submersible Sump Pumps		Yes
11214	Vertical Turbine Pumps	Yes	Yes
13520	Computer System Software	Yes	Yes
13530	Programmable Logic Controller	Yes	Yes
13562	In-Line Flow Measuring Systems	Yes	Yes
13563	Pressure and Level Instruments	Yes	Yes
13590	Network Systems	Yes	Yes
13851	Addressable Fire Alarm System	Yes	Yes
14605	Electric Monorail Systems	Yes	Yes
15110	Globe Pattern Control Valves	Yes	Yes
15500	Heating, Ventilating, and Air Conditioning		Yes
15650	Refrigeration Systems		Yes
16269	Adjustable Frequency AC Controllers	Yes	Yes
16300	Automatic Transfer Switches	Yes	Yes
16400	Low Voltage Electrical Service and Distribution		Yes
16420	Reduced Voltage Motor Starters	Yes	Yes
16485	Local Control Panels		Yes
16900	Control and Instrumentation		Yes

END OF SECTION

SECTION 01650
STARTUP REQUIREMENTS

PART 1 GENERAL

1.01 SCOPE

A. This section covers startup requirements for all items of equipment and systems including mechanical equipment. Additional requirements may be specified in specific equipment specifications. The requirements of this section shall be satisfactorily completed prior to any field tests specified in the specific equipment sections.

1.02 GENERAL

A. Equipment shall not be operated except by, or with the guidance of, qualified personnel having the knowledge necessary to obtain proper results. All items of equipment and systems shall be tested for proper operation, efficiency, and capacity. All required adjustments, tests, operation checks, and other startup activity shall be provided by qualified personnel. Contractor shall be responsible for planning, supervising, and executing the installation of Work.

1.03 COORDINATION

A. A detailed written startup plan shall be submitted to the City for approval in accordance with the submittals section prior to any startup testing. Startup plans should include manufacturer's check list as applicable. Contractor shall coordinate all tests related to startup of equipment and systems and shall report the results to Resident Engineer in accordance with the submittals section. Contractor shall accept the equipment and the test results related to starting of equipment and systems before Resident Engineer will accept the equipment and the test results.

B. When equipment is ready for a witness test, Contractor shall give written notice to Resident Engineer at least 20 days before any offsite witness testing is performed or any field witnessed performance testing, unless otherwise specified.

1.04 EQUIPMENT TESTS

A. Factory Tests

1. When specified in the specific equipment sections, the equipment will be test run at the point of manufacture and the test results will be delivered to Resident Engineer. Such equipment will not be shipped until Resident Engineer has reviewed the test results and advised the Contractor, in writing, that the equipment is acceptable for shipment. Such acceptance, however, will not be considered as final acceptance, which will only be made on the basis of the test results of the equipment after installation.

B. Preliminary Field Tests

1. All items of mechanical equipment shall be given a preliminary field test by Contractor after installation for proper operation, efficiency, and capacity. The preliminary field test shall consist of the requirements listed herein, unless exceptions or additions are indicated in the specific equipment sections.

2. Contractor's test operation of each piece of mechanical equipment shall continue for not less than 8 hours without interruption. All moving parts of equipment and machinery shall be carefully tested for operation, and adjusted so all parts move freely and function to secure satisfactory operation. All equipment shall be tested continuously under actual or simulated operating conditions. All parts shall operate satisfactorily in all respects, under continuous full load and in accordance with the specified requirements, for the full duration of the 8 hour test period. If any part of a unit shows evidence of unsatisfactory or improper operation during the 8 hour test period, correction or repairs shall be made and the full 8 hour test operation, as specified, shall be completed after all parts operate satisfactorily.

3. Tests of all process and pumping equipment, drive motors, including auxiliaries shall be made in accordance with the appropriate and approved test codes such as the American Society of Mechanical Engineers, Hydraulic Institute Standards, and IEEE.

4. Tests shall be conducted after the Work is substantially complete so each item of equipment is ready for integrated operation with other equipment at the pump station. Testing, measuring, and calibrating procedures shall be submitted to Engineer for review and acceptance prior to startup and testing of equipment.

5. The equipment shall be properly filled, by Contractor, with oil and grease, and Contractor shall furnish all power, personnel, water, chemicals, fuels, oil, grease, and auxiliaries necessary for conducting the testing of the equipment for proper operation, efficiency, and capacity.

6. The period of inspection, initial startup operation, and field adjustment shall be as needed to achieve satisfactory installation and operation of the items furnished. Any period required for instruction of City's personnel shall be as specified in the Contract Documents.

7. When the specific equipment sections indicate that an installation check is required by the equipment manufacturer, the manufacturer's representative will make all necessary field adjustments at the job site and correct defects in materials or workmanship during this test period.

8. All equipment installed under this Contract, including that furnished by others, shall be placed into successful operation according to the written instructions of the equipment manufacturer and the instructions of the manufacturer's field representative.

C. Field System Operation Test

1. After all equipment is installed and the entire system (pipeline, flow control facility, flow control valve vault, meter vault, forebay, and pump station) is ready to operate, Contractor shall conduct a field system operation test. The test shall consist of the requirements listed herein, unless exceptions or additions are indicated in the specific equipment sections.

2. The test period shall be at least 7 days, and each system shall operate under actual or simulated operating conditions before a certificate of Substantial Completion of the Work is issued. All defects of material, workmanship, or equipment which appear during this test period shall be corrected by Contractor. After such corrections are made, the 7 day test shall be repeated before a certificate of Substantial Completion of Work is issued, unless waived by Resident Engineer.

3. Contractor shall supply all power, water, oil, grease, auxiliaries, and operating personnel required for this operation test.

4. When necessary for certain items of equipment, the final adjustments and inspections will be made by factory trained service personnel (other than sales representatives), rather than by Contractor. The service personnel will also supervise the test operation. This requirement will be stated under the detailed specification for the particular piece or pieces of equipment. The manufacturer's service personnel will make adjustments and supervise testing by Contractor until such tests have been accepted by Resident Engineer.

PART 2 MANUFACTURER'S FIELD SERVICES

2.01 SERVICES FURNISHED UNDER THIS CONTRACT

A. A competent and authorized representative of the manufacturer of each item of equipment for which field services are indicated in the respective equipment section or in the equipment schedule section shall visit the site of the Work and inspect, check, adjust if necessary, and approve the equipment installation. In each case, the manufacturer's representative shall be present when the equipment is placed in operation. The manufacturer's representative shall revisit the jobsite as often as necessary until all trouble is corrected and the equipment installation and operation are satisfactory in the opinion of Engineer. All costs associated with providing an authorized representative of the manufacturer of each item shall be borne by the Contractor.

2.02 MANUFACTURER'S FIELD REPORTS

A. Each time that a manufacturer's representative visits the site, the representative shall fill out a field report of his observations and shall submit the report to the Resident Engineer.

2.03 SERVICES OF MANUFACTURER'S REPRESENTATIVE PRIOR TO EQUIPMENT STARTUP

A. The Contractor shall arrange for a qualified factory service representative from each company specified to provide manufacturer's field service. Qualification of the representative shall be appropriate to the type of equipment furnished and subject to the approval of the Engineer and the City. Where equipment furnished has significant process complexity, the Contractor shall furnish the services of engineering personnel knowledgeable in the process involved and the function of the equipment. Services of the factory representative shall be for the minimum number of days recommended by the manufacturer and approved by the Resident Engineer, but will not be less than the number of days specified in the individual equipment sections. When necessary, the Contractor shall schedule all factory representatives to be present at the same time for the purpose of coordinating the operation of all equipment.

B. After installation of the listed equipment has been completed and the equipment is presumably ready for operation, but before it is operated by others, the representative shall inspect, operate, test, and adjust the equipment. The inspection shall include but shall not be limited to the following points as applicable.

1. Soundness (without cracked or otherwise damaged parts).

2. Completeness in all details, as specified.

3. Correctness of setting, alignment, and relative arrangement of various parts.

4. Adequacy and correctness of packing, sealing, and lubricants.

C. All equipment shall be mechanically checked for proper operation. Each alarm and safety shutdown shall be checked by artificially simulating an alarm condition in each operation mode (hand, auto, remote). Defective equipment and controls disclosed by these tests shall be replaced or corrected, and the equipment placed in satisfactory operating condition.

D. The operation, testing, and adjustment shall be as required to prove that the equipment is left in proper condition for satisfactory operation under the conditions specified.

E. On completion of his work, the manufacturer's or supplier's representative shall submit to the Resident Engineer a complete signed report of the result of his inspection, operation, adjustments, and test. The report shall include detailed descriptions of the points inspected, tests and adjustments made, quantitative results obtained if such are specified, and suggestions for precautions to be taken to ensure proper maintenance. The report also shall include a certificate that the equipment conforms to the requirements of the Contract and is ready for permanent operation and that nothing in the installation will render the manufacturer's warranty null and void.

2.04 EQUIPMENT STARTUP

A. Equipment startup service shall be provided by a qualified factory service representative and by the Contractor. All lubricants, power, water, chemicals, etc., shall be furnished by the Contractor to verify operation, perform mechanical test, and provide for normal startup requirements. The factory service representative with the help of the Contractor shall start up the equipment for actual service. In the event that equipment or installation problems are experienced, the Contractor and the factory service representative shall provide the necessary service, etc., until the equipment is operating satisfactorily and performing according to the specifications at no additional cost to the City.

B. At this time, the service representative shall conduct operation and maintenance classes for the City's operators. The Contractor shall schedule the classes with the City and the Resident Engineer two weeks prior to the class.

C. The service representative shall be available for startup services and instruction for a minimum of 24 hours after the equipment is placed in operation.

2.05 DEMONSTRATION AND INSTRUCTION

A. The supplier's representative shall instruct the City's operating personnel in correct operation and maintenance procedures. The instruction shall demonstrate startup, operation, control, adjustment, troubleshooting, servicing, maintenance, and shutdown of each item of equipment. Such instruction shall be provided while the respective representative's equipment is fully operational. Onsite instruction shall be given by qualified persons who have been made familiar in advance with the equipment and systems. The Contractor shall have submitted, and the City accepted, the O&M Manuals (specified in Specification Section 01730, "Operation and Maintenance Data") prior to commencement of training.

B. The Contractor shall notify the Resident Engineer at least 28 days in advance of each equipment test or City training session.

C. Training shall be provided on-site to three separate shifts of the City's personnel between the hours of 6:00 a.m. and 9:00 p.m. as necessary.

D. The Contractor shall provide professional video taping of all training sessions. Completed, labeled tapes shall be provided to the City for each type of training session.

E. A resume of the training instructor, and agenda for the training session(s) shall be provided to Resident Engineer at least two weeks in advance of the training. The training session shall be organized into maintenance versus operation topics and identified as such on agenda.

F. Training sessions shall be organized in a format compatible with video recording. Instructors shall have well-prepared instructional material. The use of visual aids,

e.g. films, pictures, and slides, is recommended during the classroom training programs.

G. Contractor shall maintain a log of training provided, including instructors, topics (attach agenda), dates, times, and attendance list.

2.06 FIELD TESTING

A. All equipment shall be set, aligned, and assembled in conformance with the manufacturer's drawings and instructions, and as specified.

B. Field tests shall be performed by the Contractor and shall consist of the following:

1. Perform initial field tests to the extent possible without introducing product flow.

2. Check equipment for proper rotation and check motor for no-load current draw.

3. Check equipment for alignment. Direct coupled shafts with flexible or rigid couplings shall be checked for parallel and angular misalignment.

4. All bearings, gear housing, etc., shall be flushed in accordance with the manufacturer's recommendations to remove any foreign matter accumulated during shipment, storage, or installation. Lubricants shall be added in strict conformance with the manufacturer's recommendation.

5. Check power, control, and monitoring circuits, and phase sequence.

6. Check that piping systems are complete, tested, and clean of debris. Check valve installation, orientation and position.

7. Check instrumentation and control features, including signals for status, alarms, and control.

C. Upon completion of the above, and at a time approved by the Resident Engineer, the equipment will be tested by operating it as a unit with all related piping, controls, and other ancillary facilities. Operating field tests shall consist of the following:

1. Check equipment for excessive vibration and noise. Pump vibration testing shall be as specified in Specification Section 11214, "Vertical Turbine Pumps."

2. Check motor current draw under load conditions. The rated motor nameplate current shall not be exceeded.

3. Check all pumps at maximum speed for at least four points on the pump curve for capacity, head, and electric current draw.

4. Recheck alignment after unit has run under load for a minimum of 24 hours.

D. In addition to the above described field tests, any other tests specifically required by the individual equipment Specifications or by the manufacturer shall be performed by the Contractor.

E. All costs in connection with field testing of equipment such as light, lubricants, instruments, labor, equipment, etc., shall be borne by the Contractor.

F. The Contractor shall be fully responsible for the proper operation of equipment during tests and instruction periods and shall neither have nor make any claim for damage which may occur to equipment prior to the time when the City formally takes over the operation thereof.

2.07 ACCEPTANCE

A. When no other field tests for acceptance are specified in the equipment sections, at the end of the field system operation testing, each system will be accepted if, in the opinion of Resident Engineer, it has operated satisfactorily without excessive power use, wear, or need for lubrication, or requiring undue attention; and if all its rotating parts operate without excessive vibration or noise at any operating condition.

B. When other field tests for acceptance are specified in the equipment sections, acceptance shall be after all tests are satisfactorily conducted as specified in the appropriate equipment procurement specification.

C. When a field performance test for baseline is specified in the equipment sections, acceptance shall be after a completion of the baseline performance test that is conducted as specified in the pumping unit field testing - baseline performance section.

D. Acceptance of Work in connection with the installation of equipment furnished by others will be subject to approval of the manufacturer's field representative.

E. Acceptance by the City or approval of the manufacturer's field representative will not relieve Contractor of responsibility for defective Work.

2.08 PAYMENT

A. All work described in this section shall be included in the bid item listed in the bid form for the pump station and no additional compensation will be provided by the City.

END OF SECTION

SECTION 01720
FIELD RECORD DRAWINGS

PART 1 GENERAL

1.01 DESCRIPTION

A. This section specifies requirements for record drawings.

1.02 PAYMENT

A. The record drawings shall be determined to be up-to-date and complete as a pre-condition of the next month's progress payment request approval.

B. Final payment shall not be made until the marked up record drawings are delivered and approved by the Resident Engineer. Contractor shall provide a transmittal letter containing the following: Project Title, Contractor's name and address, Certification that each document as submitted is complete and accurate, and Signature of the Contractor.

1.03 MAINTENANCE OF DOCUMENTS

A. The following shall be maintained at the Contractor's field office in clean, dry, and legible condition:

B. Contract Drawings, Specifications, Addenda, approved Shop Drawings, samples, photographs, Change orders, other Modifications to the Contract, test records, survey data, Field Change Orders(s), and all other documents pertinent to Contractor's Work.

C. Documents shall be made available at all times for inspection by the City's Representatives.

D. The Contractor shall not conceal any work until the required record drawing information has been recorded. Resident Engineer may direct the Contractor to expose concealed work if work was not recorded on the record drawings.

E. The City reserves the right, at any point during the project, to view the Contractor's record drawings to ensure the Contractor is properly maintaining and keeping them up to date.

1.04 DAILY REPORTS

A. Contractor shall provide a written Daily Report to the Resident Engineer describing the work performed, conditions encountered, weather conditions, delays to the work, accidents or safety concerns, and any construction problems or deviations from the requirements of the Contract Documents. Daily report shall also show an itemized breakdown of all labor, material deliveries, equipment and subcontract labor used in performing the work.

B. Submit the Daily Report within two days after completion of the reported work day.

PART 2 MATERIALS

2.01 GENERAL

A. The City shall supply the Contractor with a set of the Contract Drawings to be utilized to record information as described below.

B. The Contractor shall maintain, on the job site, neatly and legibly marked contract drawings showing the final location of piping and appurtenances, equipment, and other components of the work.

PART 3 EXECUTION

3.01 RECORDING OF INFORMATION

A. Marking of the drawings shall be kept current by indicating all deviations from original design shown or implied on the drawings or by additional sketches as needed.

B. Contractor shall mark these plans after each portion of the work at the time of the installation or change.

C. Maintain Field Record Drawings by marking all changes in red pencil. Record and make permanent record of the following:

1. Horizontal and vertical location of structures, improvements, finished ground elevations, underground utilities and appurtenances, referenced to benchmark elevations and permanent surface improvements.

2. All field changes of dimension and detail.

3. Changes made by Contract Change Order or Field Change Order.

4. Details not on original contract Plans or submittals.

3.02 INSPECTION AND APPROVAL OF DOCUMENTS

A. All contract documents shall be made available at all times during construction for inspection by the City Engineer or Resident Engineer.

B. A review and written approval by the Resident Engineer will be required at least twice during the project.

1. The first review will take place at about 50% completion of the project as determined by the Resident Engineer.

2. The second review will take place at about 90% completion of the project as determined by the Resident Engineer.

3. Depending on complexity of the project or duration of construction additional review may be necessary as determined by the Resident Engineer.

4. Work may be suspended if the review indicates incomplete documentation.

3.03 DELIVERABLES

A. Following final inspection and completion of the punch list items, the Contractor shall provide record drawings, with recorded information, to the Resident Engineer. The Contractor shall transfer all recorded information and comments to a clean set of contract drawings which shall then be delivered to the Resident Engineer.

END OF SECTION

SECTION 01730
OPERATION AND MAINTENANCE DATA

PART 1 GENERAL

1.01 DESCRIPTION

A. Submit for review and comment by the Engineer six copies of an Operations and Maintenance Manual containing all manufacturers' operation, maintenance, and other data pertinent to equipment supplied for the project. Upon receipt of the Engineer's written acceptance of the Operations and Maintenance Manual, submit two printed copies of the accepted manual and one electronic version of all printed documents in portable document format (pdf) on CD or DVD disc. The requirements of this section are in addition to the individual operation and maintenance manuals submitted with each final shop drawing submittal.

B. The Contractor shall submit all of the required Operation and Maintenance Manuals and obtain City approval prior to equipment start up.

1.02 RELATED REQUIREMENTS

A. Section 01620 - Equipment Schedule.

1.03 OPERATION AND MAINTENANCE DATA

A. The Operation and Maintenance Manual shall include, but not be limited to, the following items:

1. List of equipment furnished for project with name, mailing address, email address, and telephone number of vendor; and name, mailing address, email address, and telephone number of nearest service center.

2. List of serial numbers of equipment furnished.

3. Equipment data sheets.

4. Manufacturer's Installation instructions.

5. Manufacturer's Startup and operation instructions.

6. Manufacturer's maintenance instructions.

7. Manufacturer's parts lists, including list of fuses, lamps, seals, and other expendable equipment and devices. Specify size, type, and ordering description. List name, mailing address, email address, and telephone number of parts vendor.

8. Troubleshooting guide that indicates common problems or malfunctions, and steps necessary to identify and correct the problem.

9. Certifications, when applicable.

10. Testing documents, when applicable.

11. Manufacturer's warranties.

12. Copy of final shop drawings.

PART 2 MATERIALS – NOT USED

PART 3 EXECUTION

3.01 PREPARE MANUALS

A. Compile and organize the manufacturers' operation, maintenance materials, and other data pertinent to equipment supplied for the project into three-ring binders. The Operations and Maintenance manual shall have a cover sheet, spine label, table of contents listing each piece of equipment contained in the manual, and section tabs labeled with the name of the equipment, e.g. 6-inch Butterfly Valves. When the data exceeds the size of binder, label each binder as a volume, e.g. Volume I, Mechanical, Volume II, Electrical.

B. Title the first section of the manual "Equipment List" and include the following:

1. List of equipment furnished for project with name, mailing address, email address, and telephone number of vendor, and name, mailing address, email address, and telephone number of nearest service center.

2. List of serial numbers of equipment furnished.

3. List of order numbers of equipment furnished.

C. Organize the Operations and Maintenance data in the order shown under paragraph 1.03. Provide section tabs for each data item.

D. Blank equipment data sheet and sample data sheets are included in this section.

END OF SECTION

EQUIPMENT DATA SHEET

Preventive Maintenance Program	**Equipment Record Number**	
EQUIPMENT DESCRIPTION	ELECTRICAL OR MECHANICAL DATA	
Name:	Size:	
Serial No.:	Model:	
Order No.:		
Vendor:		
Vendor Address:	Type:	
	Mfr.:	
Vendor Rep:	Voltage:	Amps:
Phone:	Phase:	rpm:
Maintenance Work to be Done		Frequency*
OPERATING REQUIREMENTS AND REFERENCE		

*D - daily, W - weekly, B - biweekly, M - monthly, Q - quarterly, S - semiannually, A – annually

SAMPLE

Preventive Maintenance and Operating Requirement Sheets

Preventive Maintenance Program	**Equipment Record Number**	
EQUIPMENT DESCRIPTION	ELECTRICAL OR MECHANICAL DATA	
Name: Pump No. 1 Tag No.: P-01	Size: 15 hp	
Serial No.: 123456ABC	Model: 140T Frame Serial No. 987654ZY Class F Insulation W/Space Heater	
Order No.: 123456xx		
Vendor: ABC Pump Co.		
Vendor Address: 1111 Pump Circle Newport Beach, CA 92663	Type:	
	Mfr.: DEF Motors, Inc.	
Vendor Rep: XYZ Equipment, Inc.	Voltage: 460	Amps: 20
Phone: 714/752-0505	Phase: 3	rpm: 1,800
Maintenance Work to be Done		Frequency*
1. Operate all valves and check such things as a) bearing temperature, b) changes in running sound, c) suction and discharge gage readings, d) pump discharge rate, and e) general condition of the drive equipment. 2. Check packing. 3. Checking pumping unit for any dust, dirt, or debris. (Continued on attached sheet)		D D W
OPERATING REQUIREMENTS AND REFERENCE		

*D - daily, W - weekly, B - biweekly, M - monthly, Q - quarterly, S - semiannually, A - annually

SAMPLE

Preventive Maintenance and Operating Requirement Sheets

	Equipment Record Number	
EQUIPMENT DESCRIPTION	ELECTRICAL OR MECHANICAL DATA	
Name:	Size:	
Serial No.:	Model:	
Vendor:		
Vendor Address:	Type:	
	Mfr.:	
Vendor Rep:	Voltage:	Amps:
Phone:	Phase:	rpm:
Maintenance Work to be Done		Frequency*
4. Lubricate bearing frame and motor bearings (consult manufacturer's instructions for type of grease or oil.) 5. Disassemble and change or repair the following a) impeller, b) shaft sleeve, d) rotary seals, and e) sleeve bearings.		Q A
OPERATING REQUIREMENTS AND REFERENCE		

*D - daily, W - weekly, B - biweekly, M - monthly, Q - quarterly, S-semiannually, A – annually

SECTION 01770
CLOSEOUT PROCEDURES

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, Greenbook, Whitebook and other Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:

1. Substantial Completion procedures.
2. Final completion procedures.
3. Warranties.
4. Final cleaning.
5. Repair of the Work.

B. Related Requirements:

1. Section 01380 - Construction Videotapes & Photographs.
2. Section 01650 - Startup Requirements.
3. Section 01720 - Field Record Drawings.
4. Section 01730 – Operation and Maintenance Data.

1.03 SUBMITTALS

A. Contractor's List of Incomplete Items: Initial submittal at Substantial Completion.

B. Certified List of Incomplete Items: Final submittal at Final Completion.

1.04 CLOSEOUT SUBMITTALS

A. Certificates of Release: From authorities having jurisdiction.

B. Certificate of Insurance: For continuing coverage.

1.05 MAINTENANCE MATERIAL SUBMITTALS

A. Schedule of Maintenance Material Items: For maintenance material submittal items specified in other Sections.

1.06 SUBSTANTIAL COMPLETION PROCEDURES

A. Contractor's List of Incomplete Items: Prepare and submit a list of items to be completed and corrected (Contractor's punch list), indicating the value of each item on the list and reasons why the Work is incomplete.

B. Contractor shall, within seven (7) days, correspond in writing to City Engineer, certifying that entire work is substantially complete.

C. Submittals Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.

1. Certificates of Release: Obtain and submit releases from authorities having jurisdiction permitting City unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.

2. Submit closeout submittals specified in Specification Sections 01720 and 01730, including project record documents, operation and maintenance manuals, final completion construction photographic documentation, damage or settlement surveys, property surveys, and similar final record information.

3. Submit closeout submittals specified in individual Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.

4. Submit maintenance material submittals specified in individual Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by Resident Engineer. Label with manufacturer's name and model number where applicable.

5. Submit test/adjust/balance records.

6. Submit changeover information related to City's occupancy, use, operation, and maintenance.

D. Procedures Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.

1. Advise City of pending insurance changeover requirements.

2. Make final changeover of permanent locks and deliver keys to City. Advise City's personnel of changeover in security provisions.

3. Complete startup and testing of systems and equipment.

4. Perform preventive maintenance on equipment used prior to Substantial Completion.

5. Instruct City's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training video recordings specified in Specification Section 01650, "Startup Requirements."

6. Advise City of changeover in heat and other utilities.

7. Participate with City in conducting inspection and walkthrough with local emergency responders.

8. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.

9. Complete final cleaning requirements, including touchup painting.

10. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.

1.07 FINAL COMPLETION PROCEDURES

A. Submittals Prior to Final Completion: Before requesting final inspection for determining final completion, complete the following:

1. Submit a final Application for Payment.

2. Certified List of Incomplete Items: Submit certified copy of City's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by City. Certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.

3. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.

4. Submit pest-control final inspection report.

B. Inspection: Submit a written request for final inspection to determine acceptance a minimum of 10 days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, City will either proceed with inspection or notify Contractor of unfulfilled requirements. City will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.

C. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.08 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

A. Organization of List: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.

1. Organize list of spaces in sequential order, starting with exterior areas first.

2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.

3. Include the following information at the top of each page:

a) Project name.

b) Date.

c) Name of City.

d) Name of Engineer and Resident Engineer.

e) Name of Contractor.

f) Page number.

1. Submit list of incomplete items in the following format:

g) MS Excel electronic file. City and Architect, through Resident Engineer, will return annotated file.

1.09 SUBMITTAL OF PROJECT WARRANTIES

A. Time of Submittal: Submit written warranties on request of Architect and City for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated, or when delay in submittal of warranties might limit City's rights under warranty.

B. Partial Occupancy: Submit properly executed warranties within **15** days of completion of designated portions of the Work that are completed and occupied or used by City during construction period by separate agreement with Contractor.

C. Organize warranty documents into an orderly sequence based on the table of contents of Contract Documents.

1. Bind warranties and bonds in heavy-duty, three-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch paper.

2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.

3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.

D. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 PRODUCTS

2.01 MATERIALS

A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

PART 3 EXECUTION

3.01 FINAL CLEANING

A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.

B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.

1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a designated portion of Project:

a) Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.

b) Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.

c) Rake grounds that are neither planted nor paved to a smooth, even-textured surface.

d) Remove tools, construction equipment, machinery, and surplus material from Project site.

e) Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.

f) Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.

g) Vacuum concrete floors.

h) Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Polish mirrors and glass, taking care not to scratch surfaces.

i) Remove labels that are not permanent.

j) Wipe surfaces of mechanical and electrical equipment and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.

k) Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.

l) Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.

m) Clean ducts, blowers, and coils if units were operated without filters during construction or that display contamination with particulate matter on inspection.

   i) Clean HVAC system in compliance with NADCA Standard 1992-01. Provide written report on completion of cleaning.

n) Clean light fixtures, lamps, globes, and reflectors to function with full efficiency.

o) Leave Project clean and ready for occupancy.

C. Construction Waste Disposal: Comply with waste disposal requirements in Specification Section 01085, "Construction Waste Management and Disposal."

3.02 REPAIR OF THE WORK

A. Complete repair and restoration operations before requesting inspection for determination of Substantial Completion.

B. Repair or remove and replace defective construction. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment. Where damaged or worn items cannot be repaired or restored, provide replacements. Remove and replace operating components that cannot be repaired. Restore damaged construction and permanent facilities used during construction to specified condition.

1. Remove and replace chipped, scratched, and broken glass, reflective surfaces, and other damaged transparent materials.

2. Touch up and otherwise repair and restore marred or exposed finishes and surfaces. Replace finishes and surfaces that that already show evidence of repair or restoration.

   a) Do not paint over "UL" and other required labels and identification, including mechanical and electrical nameplates. Remove paint applied to required labels and identification.

3. Replace parts subject to operating conditions during construction that may impede operation or reduce longevity.

4. Replace burned-out bulbs, bulbs noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.

END OF SECTION

SECTION 02050
DEMOLITION

PART 1 GENERAL

1.01 DESCRIPTION

A. This section describes demolition and removal of existing site features as indicated on the drawings

1.02 RELATED WORK SPECIFIED ELSEWHERE

Section 01530 - Protection of Existing Facilities

Section 02200 - Earthwork

1.03 SUMMARY

A. Section Includes:

1. Demolition and removal of existing site improvements and structures.

2. Removing below-grade construction.

3. Disconnecting, capping or sealing, and removing site utilities.

1.04 DEFINITIONS

A. Remove: Detach items from existing construction and dispose of them off-site unless indicated to be salvaged.

B. Remove and Salvage: Detach items from existing construction, in a manner to prevent damage, and store. Include fasteners or brackets needed for reattachment elsewhere.

1.05 MATERIALS OWNERSHIP

A. Unless otherwise indicated, demolition waste becomes property of Contractor.

B. Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to City that may be uncovered during demolition remain the property of City.

1.06 PREINSTALLATION MEETINGS

A. Pre-demolition Conference: Conduct conference at Project site.

1. Inspect and discuss condition of construction to be demolished.

2. Coordinate hazardous materials removals to be performed by the City.

3. Review and finalize demolition schedule and verify availability of demolition personnel, equipment, and facilities needed to make progress and avoid delays.

4. Review and finalize protection requirements.

5. Review procedures for noise control and dust control.

6. Review procedures for protection of adjacent buildings.

1.07 SUBMITTALS

A. Proposed Protection Measures: Submit report, including Drawings, that indicates the measures proposed for protecting individuals and property, for environmental protection, for dust control and, for noise control. Indicate proposed locations and construction of barriers.

1. Adjacent Buildings: Detail special measures proposed to protect adjacent buildings to remain including means of egress from those buildings.

B. Schedule of Building Demolition Activities: Indicate the following:

1. Detailed sequence of demolition work, with starting and ending dates for each activity.

2. Temporary interruption of utility services.

3. Shutoff and capping or re-routing of utility services.

C. Pre-demolition Photographs or Video: Show existing conditions of adjoining construction and site improvements, including finish surfaces that might be misconstrued as damage caused by demolition operations. Perform pre-construction video as specified in the Whitebook.

1.08 FIELD CONDITIONS

A. Buildings/Structures immediately adjacent to demolition area will be occupied. Conduct building demolition so operations of occupied buildings will not be disrupted.

1. Provide not less than 72 hours written notice of activities that will affect operations of adjacent occupied buildings.

2. Maintain access to existing walkways, exits, and other facilities used by occupants of adjacent buildings.

a) Do not close or obstruct walkways, exits, or other facilities used by occupants of adjacent buildings without written permission from authorities having jurisdiction.

B. Conditions existing at time of inspection for bidding purpose will be maintained by City as far as practical.

C. On-site storage or sale of removed items or materials is not permitted.

1.09 COORDINATION

A. Coordinate demolition schedule with the Resident Engineer.

PART 2 MATERIALS

2.01 PERFORMANCE REQUIREMENTS

A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

PART 3 EXECUTION

3.01 GENERAL

A. Perform removal and demolition work specified and indicated in the drawings. Prepare remaining surfaces to receive new scheduled and specified materials and finishes or finish to match adjacent surfaces if no additional work is scheduled or indicated.

3.02 EXAMINATION

A. Verify that utilities have been disconnected and capped before starting demolition operations.

1. Electricity to the site was provided by San Diego Gas and Electric (SDG&E). The electrical service has since been disconnected.

2. Potable water is provided by the City but water services have since been turned off.

B. Review Project Record Documents of existing construction or other existing condition and hazardous material information provided by City. City does not guarantee that existing conditions are same as those indicated in Project Record Documents.

3.03 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

A. Existing Utilities to be Disconnected: Locate, identify, disconnect, and seal or cap off utilities serving buildings and structures to be demolished.

1. Arrange to shut off utilities with utility companies.

2. If removal, relocation, or abandonment of utility services will affect adjacent occupied buildings, then provide temporary utilities that bypass buildings

and structures to be demolished and that maintain continuity of service to other buildings and structures.

3. Cut off pipe or conduit a minimum of 24 inches below grade. Cap, valve, or plug and seal remaining portion of pipe or conduit after bypassing according to requirements of authorities having jurisdiction.

4. Do not start demolition work until utility disconnecting and sealing have been completed and verified in writing.

3.04 PROTECTION

A. Existing Facilities: Protect adjacent walkways, building entries, and other building facilities during demolition operations. Maintain exits from existing buildings.

B. Temporary Shoring: Provide and maintain interior and exterior shoring, bracing, or structural support to preserve stability and prevent unexpected movement or collapse of construction being demolished.

1. Strengthen or add new supports when required during progress of demolition.

C. Existing Utilities to Remain: Maintain utility services to remain and protect from damage during demolition operations.

1. Do not interrupt existing utilities serving adjacent occupied or operating facilities unless authorized in writing by City and authorities having jurisdiction.

2. Provide temporary services during interruptions to existing utilities, as acceptable to City and authorities having jurisdiction.

a) Provide at least 72 hours written notice to occupants of affected buildings if shutdown of service is required during changeover.

D. Temporary Protection: Erect temporary protection, such as walks, fences, railings, canopies, and covered passageways, where required by authorities having jurisdiction and as indicated. Comply with requirements in Specification Section 01530, "Protection Of Existing Facilities."

1. Protect adjacent buildings and facilities from damage due to demolition activities.

2. Protect existing site improvements, appurtenances, and landscaping to remain.

3. Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.

4. Provide protection to ensure safe passage of people around building demolition area and to and from occupied portions of adjacent buildings and structures.

5. Protect walls, windows, roofs, and other adjacent exterior construction that are to remain and that are exposed to building demolition operations.

6. Erect and maintain dustproof partitions and temporary enclosures to limit dust, noise, and dirt migration to occupied portions of adjacent buildings.

E. Remove temporary barriers and protections where hazards no longer exist. Where open excavations or other hazardous conditions remain, leave temporary barriers and protections in place.

3.05 DEMOLITION, GENERAL

A. General: Demolish indicated site improvements completely. Use methods required to complete the Work within limitations of governing regulations and as follows:

1. Do not use cutting torches until work area is cleared of flammable materials. Maintain portable fire-suppression devices during flame-cutting operations.

2. Maintain fire watch during and for at least 8 hours after flame-cutting operations.

3. Maintain adequate ventilation when using cutting torches.

4. Locate building demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.

B. Site Access and Temporary Controls: Conduct building demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

1. Do not close or obstruct streets, walks, walkways, or other adjacent occupied or used facilities without permission from City and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic-ways if required by authorities having jurisdiction.

2. Use water and other suitable methods to limit spread of dust and dirt. Comply with governing environmental-protection regulations. Do not use water when it may damage adjacent construction or create hazardous or objectionable conditions, such as ice, flooding, and pollution.

C. Explosives: Use of explosives is not permitted.

3.06 DEMOLITION BY MECHANICAL MEANS

A. Below-Grade Construction: Demolish foundation walls and other below-grade construction.

1. Remove below-grade construction, including basements, foundation walls, and footings, completely.

B. Existing Utilities: Demolish and remove existing utilities and below-grade utility structures per demolition drawings.

3.07 SITE RESTORATION

A. Below-Grade Areas: Rough grade below-grade areas ready for further excavation or new construction.

B. Site Grading: Uniformly rough grade area of demolished construction to a smooth surface, free from irregular surface changes. Provide a smooth transition between adjacent existing grades and new grades.

3.08 REPAIRS

A. Promptly notify City of damage to adjacent buildings.

3.09 DISPOSAL OF DEMOLISHED MATERIALS

A. Abate, remove, and dispose of all hazardous materials in accordance with applicable State and Federal Regulations.

B. Remove demolition waste materials from Project site and dispose of them in an EPA-approved construction and demolition waste landfill acceptable to authorities having jurisdiction and recycle or dispose of them according to the Whitebook.

1. Do not allow demolished materials to accumulate on-site.

2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

C. Remove and dispose of all debris and trash from the property leaving the site in a clean and neat appearance.

D. Do not burn demolished materials.

3.10 CLEANING

A. Clean adjacent structures and improvements of dust, dirt, and debris caused by building demolition operations. Return adjacent areas to condition existing before building demolition operations began.

1. Clean roadways of debris caused by debris transport.

END OF SECTION

SECTION 02110
CLEARING, STRIPPING, AND GRUBBING

PART 1 GENERAL

1.01 DESCRIPTION

A. This section describes the work included in clearing, stripping, grubbing, and preparing the project site for construction operations.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 02200 - Earthwork

1.03 CLEARING

A. Remove surplus soil material, unsuitable topsoil, shrubs, brush, limbs, sticks, branches, and other vegetative growth. Remove rocks, tiles, and lumps of concrete. Remove all evidence of their presence from the surface. Remove trash piles and rubbish. Legally dispose of all materials off of City's property.

B. Protect structures and piping above and below ground, trees, shrubs, and vegetative growth which are not designated for removal.

1.04 STRIPPING

A. Remove and legally dispose of organic sod, grass and grass roots, and other objectionable material remaining after clearing.

1.05 GRUBBING

A. After clearing and stripping, remove and legally dispose of wood or root matter, including stumps, logs, trunks, roots, or root systems greater than 1 inch in diameter or thickness to a depth of 24 inches below exposed subgrade.

PART 2 MATERIALS

2.01 TREES AND SHRUBBERY

A. Existing trees, shrubbery, and other vegetative material may not be shown in the drawings. Inspect the site as to the nature, location, size, and extent of vegetative material to be removed or preserved, as specified herein.

B. Trees to be removed are identified on the Plans. Preserve in place all existing trees not designated for removal, unless otherwise directed by the Resident Engineer.

2.02 PRESERVATION OF TREES, SHRUBS, AND OTHER PLANT MATERIAL

A. Save and protect plant materials (trees, shrubbery, and plants) beyond the limits of clearing and grubbing from damage resulting from the work. No filling, excavating, trenching, or stockpiling of materials will be permitted within the drip line of these plant materials. The drip line is defined as a circle drawn by extending a line vertically to the ground from the outermost branches of a plant or group of plants. To prevent soil compaction within the drip line area, no equipment will be permitted within this area.

B. Cut and remove tree branches where necessary for construction. Remove branches other than those required for a balanced appearance of any tree. Treat cuts with a tree sealant.

PART 3 EXECUTION

3.01 CLEARING, STRIPPING, AND GRUBBING AREAS AND LIMITS

A. Clear, strip, and grub excavation and embankment areas for construction of new reservoir, new pump station, new flow control facility, new retaining walls, tunnel piping, and drainage piping and structures.

B. Limits of clearing, stripping, and grubbing:

1. Excavation for embankment repair: 5 feet beyond edge of slope repair.

2. Trench excavation for piping, electrical conduits, and drainage structures: 3 feet from edge of trench.

3.02 REMOVAL AND DISPOSAL OF TREES

A. Remove and dispose of entire tree including root ball and trailing roots.

3.03 DISPOSAL OF CLEARING AND GRUBBING DEBRIS

A. Do not burn combustible materials. Remove cleared and grubbed material from the worksite and dispose.

3.04 DISPOSAL OF STRIPPINGS

A. Remove stripped material and dispose offsite.

3.05 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials including trash and debris, and legally dispose of them off City's property.

B. Separate recyclable materials produced during site clearing from other non-recyclable materials. Store or stockpile without intermixing with other materials, and transport them to recycling facilities. Do not interfere with other Project work.

END OF SECTION

SECTION 02200
EARTHWORK

PART 1 GENERAL

1.01 SCOPE

A. This section covers earthwork and shall include the necessary clearing, grubbing, and preparation of the site; removal and disposal of all debris; excavation; handling, storage, transportation, and disposal of all excavated material; all necessary sheeting, shoring, and protection work; preparation of sub-grades; backfilling; construction of fills and embankments; surfacing and grading; and other appurtenant work.

1.02 GENERAL

A. With reference to the terms and conditions of the construction standards for excavations set forth in OSHA "Safety and Health Regulations for Construction", Chapter XVII of Title 29, CFR, Part 1926 and the California Cod of Regulations Construction Safety Orders, Contractor shall employ a competent person and, when necessary based on the regulations, a registered professional engineer, to act upon all pertinent matters of the work of this section.

1.03 REFERENCE

A. The publications listed below form a part of this specification to the extent referenced. Where conflicts arise between this document and the referenced specification, code, or standard, the more restrictive specifications shall govern. The publication is referenced in the text by basic designation only. The latest edition available on the date of issue of Contract Documents shall be used.

1. Standard Specifications for Public Works Construction "Greenbook" (SSPWC) and City of San Diego Supplements "Whitebook".

2. Reference to soil classification types shall be pursuant to the Unified Soil Classification System.

3. The project Geotechnical Report entitled "Geotechnical Study, Mohawk Pump Station, prepared by VO Engineering dated September 2, 2014", and any subsequent addenda, shall be incorporated by reference.

1.04 SUBMITTALS

A. Drawings, specifications, and data covering the proposed materials shall be submitted in accordance with Specification Section 01300, "Submittals".

B. At least 30 days before starting construction of sheeting and shoring, the sheeting and shoring design engineer shall complete and submit the sheeting and shoring design. A separate shop drawing shall be submitted for each unique design. The

submittal shall be signed and sealed by the registered professional engineer that designed the protection system. The professional engineer shall be licensed and registered in the State of California.

C. At least 30 days prior to starting any backfill operations, the Contractor shall submit a general Backfill Work Plan for Engineer review and approval and which shall include as a minimum: a Backfill Quality Control Plan, types of equipment used for compaction, methods used to protect backfill or subgrade surface, material source and test results, placement procedures, survey control, and backfill quantity and quality reporting procedures.

D. Filter Fabric and Geotextile Data. Complete descriptive and engineering data for the fabric and geotextile shall be submitted in accordance with Specification Section 01300, "Submittals". Data submitted shall include:

1. A 12-inch square sample of fabric or geotextile;

2. Manufacturer's descriptive product data;

3. Installation instructions.

E. Geocomposite Sheet Drain. Complete descriptive and engineering data for the geocomposite sheet drain including manufacturer's instructions for installation. A 6-inch square sample shall be included in the submittal.

F. Contractor shall submit a report from a testing laboratory verifying that all materials conform to the requirements specified and are asbestos free. Material test report(s) shall be dated within 6 months from the Notice to Proceed for this project.

1.05 EARTHWORK CONTRACTOR

A. The Earthwork Contractor (Contractor) shall be qualified, experienced, and knowledgeable in earthwork logistics, preparation and processing of ground to receive fill, moisture-conditioning and processing of fill, and compacting fill. The Contractor shall review and accept the plans, geotechnical report(s), and these Specifications prior to commencement of grading and earthwork activities. The Contractor shall be solely responsible for performing the grading in accordance with the plans and specifications. The Contractor shall prepare and submit to the City a work plan that indicates the sequence of earthwork grading, the number of "spreads" of work and the estimated quantities of daily earthwork contemplated for the site prior to commencement of grading. The Contractor shall inform the City of changes in work schedules and updates to the work plan at least 24 hours in advance of such changes so that appropriate observations and tests can be planned and accomplished.

B. The Contractor shall have the sole responsibility to provide adequate equipment and methods to accomplish the earthwork in accordance with the applicable grading codes and agency ordinances, these Specifications, grading plans, and the recommendations in the referenced geotechnical report(s).

1.06 TESTING

A. The City will pay for compaction and relative density as described below. Testing services and scheduling shall be coordinated with the Resident Engineer.

1. Determine laboratory moisture-density relations of soils per ASTM D1557. If nuclear methods are used for in-place density determination, the compaction test results for maximum dry density and optimum water content shall be adjusted in accordance with ASTM D4718. This will be required for determination of percent relative compaction and moisture variation from optimum.

2. Determine the relative density of cohesionless soils per ASTM D4253 and D4254.

3. Sample materials per ASTM D75.

4. "Relative compaction" is the ratio, expressed as a percentage, of the in place dry density to the laboratory maximum dry density.

5. Compaction shall be deemed to comply with the specifications when no tests fall below the specified relative compaction. The Contractor shall pay the costs of any retesting of work not conforming to the specifications.

B. The City will also test:

1. Particle size analysis of soils and aggregates using ASTM D 422

2. Determination of sand equivalent value using ASTM D 2419

1.07 FIELD QUALITY CONTROL

A. Provide the Resident Engineer a minimum 24 hours advance notice of any Work which shall require testing and sampling as specified herein. The cost to the City associated with any testing, sampling, and inspection scheduled by the Engineer on account of the advance notice provided by the Contractor that is delayed or prevented from occurring on the scheduled day due to insufficient progress or other fault of the Contractor, shall be backcharged to the Contractor and deducted from future partial or final payments.

B. Allot sufficient time during construction for the performance of any quality control testing deemed necessary by the Engineer. Permit the Engineer to make field density tests of any compacted backfill layer prior to placing additional backfill material. Provide test trenches and excavations including excavation, trench support, and groundwater removal for the field soils testing operations. The trenches and excavations shall be provided at the locations and to the depths required by the Engineer.

C. Any test falling below the specified relative compaction shall be deemed non-compliant with the specifications. Rework the entire area between locations that have passed until all tests in the area meet the specified relative compaction.

D. The Contractor shall be backcharged the cost of retesting failing tests, including the initial retest. Such backcharges shall be deducted from future partial or final payments.

1.08 CLASSIFICATION OF EXCAVATED MATERIALS

A. Classification of excavated materials shall be made as follows:

1. Rock

a) Rock is defined as material which by actual demonstration, in the City's opinion, cannot be reasonably loosened or ripped by a single-tooth, hydraulically operated ripper mounted on a Caterpillar D-9L dozer or Caterpillar 235 trackhoe, or equivalent in proper operating condition; and which must be systematically drilled and blasted or broken by a power-operated hammer, hydraulic rock breaker, expansive compounds, or similar means prior to removal. The material will be defined as rock only after the Contractor has, in the opinion of the City, made a reasonable attempt to remove it using equipment equivalent to that described herein.

2. Soil

a) All material not classified as rock.

1.09 DISPOSAL OF EXCESS MATERIAL

A. The Contractor, at his own expense, shall legally dispose of all excess excavated soil at an appropriately licensed and permitted landfill. No prearranged disposal site or related permits have been determined or secured by the City.

1.10 MATERIAL AVAILABILITY

A. Sufficient earthwork material to complete the work is not available at the site. Obtain approved backfill material from onsite or offsite borrow areas. The City has not identified or located sources for required earthwork materials. The Contractor shall secure source of material and permits to complete the project requirements.

1.11 MEASUREMENT AND PAYMENT

A. Payment for all the work in this section, exclusive of authorized overexcavation, shall be included as part of the lump-sum bid amount for the pump station facility in the Bid Schedule and no additional compensation will be allowed therefore.

B. Payment for trenching and other earthwork activities beyond the limits of the pump station site shall be included in the unit price bid for pipelines and no additional compensation will be allowed therefore.

1.12 MEASUREMENT AND PAYMENT FOR AUTHORIZED OVEREXCAVATION

A. Measurement of the volume of material for payment of authorized overexcavation will be made by taking cross sections after excavation and calculating the volume using the average end area method. The Resident Engineer will measure and calculate the volume. A change order will be negotiated according to actual time, material volume of earthwork and import, placement and compaction of suitable backfill material. No payment will be made for unauthorized excavated and fill material exceeding the contract lines and grades.

1.13 MEASUREMENT AND PAYMENT FOR ROCK

A. The basis of bid for bid items in the bid form shall consider earth materials as soil. Rock as defined in paragraph 1.08.A. will not be encountered.

B. Rock Excavation Adjustment

1. An adjustment per cubic bank yard will be provided to the Contractor for rock excavation as determined by the Resident Engineer.

1.14 MEASUREMENT AND PAYMENT FOR GROUNDWATER.

A. The basis of bid for bid items in the bid form is groundwater will be encountered at the locations indicated on geotechnical boring logs.

B. Contractor shall include all costs for performing dewatering operations as may be required for compliance with the Whitebook in the lump sum bid item for the pump station and the unit price bid items for pipeline installation and no additional compensation will be allowed therefore.

PART 2 PRODUCTS

2.01 MATERIALS

A. General Fill and Embankment Materials. Imported soils are needed to raise the site grades. All material to be used in fills and embankments shall be free from rocks or stones larger than the required size in their greatest dimension, brush, stumps, logs, roots, debris, clay and other organic or deleterious materials. The organic content of the fill material shall be less than 1 percent by weight. The fill material shall not contain more than 40 percent material by dry weight larger than the ¾-inch diameter.

B. Oversize material defined as rock, or other irreducible material with a maximum dimension greater than or equal to 4 inches shall not be buried or placed in fill. No

rocks or stones larger than 1 inch size shall be placed in the upper 18 inches of any fill or embankment.

C. Material imported from the Contractor's off site sources shall be low expansion potential granular soil (EI 50 or less), low corrosivity potential, and with a plasticity index of 12 or less. Imported material shall have water soluble chloride content of less than 500 part per million (ppm), water soluble sulfate content of less than 0.1 percent, and pH of 5.5 or higher.

D. To the maximum extent available, excess suitable material obtained from structure and trench excavation shall be used for the construction of general fills and embankments provided it meets the requirements specified and specific written permission has been obtained from the City Engineer. This will require the material to be tested by the City's geotechnical consultant at the Contractor's expense. Additional material shall be provided from the Contractor's off-site source.

E. Granular Fill. Granular fill material shall be crushed rock or gravel suitable for use as a free draining sub-base beneath slabs and foundations. Granular fill shall be free from dust, clay, and trash; hard, durable, non-friable; and shall be graded 3/4 inch to No. 4 as defined in ASTM C33 for No. 67 coarse aggregate. Granular fill shall meet the quality requirements for ASTM C33 coarse aggregate. Only crushed rock with angular particles shall be used when the perimeter of the granular fill is not confined or otherwise subject to raveling, such as on a slope. Crushed rock shall be product of crushing rock or gravel. The portion of the material retained on a 3/8 inch sieve shall contain at least 50 percent particles having three or more fractured faces.

F. Structure Backfill. Structure backfill shall be defined as the material placed around and outside of structures within a zone starting at the outside edge of the perimeter footing and rising at a 1 horizontal to 1 vertical slope away from the footing. Structure backfill shall comply with Greenbook section 300-3.5.2

G. Imported Granular Material.

1. Imported granular material shall be used within the Pipe and Trench Zones and as backfill below and around concrete vaults and manholes and other locations as indicated on the drawings. Imported granular material shall be installed a minimum of 3 feet from the outside edge of the structure, all around the structure, and to the full depth (and below as required) of the structure.

2. Imported Granular material shall be free from clay balls, organic matter, and other deleterious substances and conforming to the following gradations:

Sieve Size	Percent Passing By Weight
3/8 inch	100
No. 4	75 to 100
No. 30	12 to 50

No. 100	5 to 20
No. 200	0 to 10

3. Sand shall have a minimum sand equivalent of 30 per ASTM D2419 and a coefficient of uniformity of 3 or greater.

H. Filter Fabric and Geotextile. Filter fabric shall be used as directed by the contract documents or when excessively wet, soft, spongy, or similarily unstable material is encountered or in areas of suspected high groundwater. Filter fabric shall be provided in rolls wrapped with covering for protection from mud, dirt, dust, and debris.

1. Filter Fabric Type A.

a) Filter fabric Type A shall be provided for installation at locations indicated on the drawings and as specified herein. Filter fabric Type A shall be a non-woven fabric consisting of only continuous chains of polymeric filaments or yarns of polyester formed into a stable network by needle punching. The fabric shall be inert to commonly encountered chemicals; shall be resistant to mildew, rot, ultraviolet light, insects, and rodents; and shall have the indicated properties:

Property	Test Method	Unit	Min Roll Value*
Fabric Weight	ASTM D3776	oz/yd2	5.7
Grab Strength	ASTM D4632	lb	155
Grab Elongation	ASTM D4632	percent	50
Mullen Burst Strength	ASTM D3786	psi	190
Apparent Opening Size	CW-02215	U.S. Standard Sieve Size	70

*Minimum average roll value in weakest principal direction.

Filter fabric shall be Mirafi No. 140N or City approved equal.

I. Geocomposite Sheet Drain.

1. Geocomposite sheet drain shall consist of a continuous three-dimensional plastic drainage core wrapped on one side in a nonwoven filter fabric permeable to water flow. The filter fabric shall be bonded to the individual dimples of the molded plastic core to minimize fabric intrusion into the flow channels caused by the backfill pressure. The fabric shall extend beyond the edges of the core to provide overlap for the adjacent panels.

The geocomposite sheet drain shall have at least the following properties:

Property	Test Method	Unit	Specification

Standard Crush Strength	ASTM D 1621	Psi	65
Trasmissivity at 1.45 psi	ASTM D4716	Gal/min/ft	6
Trasmissivity at 14.5 psi	ASTM D4716	Percent	15

2. The filter fabric used with the geocomposite sheet drain shall be "Marafi 140N" or Amoco "4545" or City approved equal. Geocomposite sheet drain shall be "Miradrain 6000" as manufactured by Mirafi, Inc., or "Greenstreak" sheet drain as manufactured by Greenstreak, Inc. or City approved equal.

J. Polyethylene Film. Polyethylene film beneath concrete slabs or slab base course material shall be Product Standard PS17, 6 mil minimum thickness.

K. Drain Pipe. Back of wall drain pipe shall be 4-inch diameter perforated and solid pipe, Schedule 40 polyvinyl chloride (PVC) conforming to the requirements of ASTM D1785. Perforated sections of pipe shall be two rows of 3/8-inch diameter holes 60 degrees apart spaced at 6-inch on center. Fittings for drain pipe shall be Schedule 40 Type II PVC solvent weld type conforming to ASTM D2467.

L. Drain Rock. Drain rock shall consist of a well-graded processed gravel with 100 percent finer than 1. 5 inches and 100 percent coarser than the U.S. No.4 sieve.

M. Portland Cement. Portland Cement shall conform to the requirements of SSPWC Section 201-1.21.

N. Aggregates. Aggregates shall conform to the requirements of SSPWC Section 201-1.2.2, except as noted below. Aggregates shall be pretested in CLSM mixtures similar to those anticipated for the work, confirming their ability to perform as required for the specific application. Aggregates not in conformance with SSPWC Section 201-1.2.2 may be used when approved by the Engineer, providing the material has a minimum sand equivalent of 20, the percentage passing the No.200 sieve does not exceed 12 percent, and the fines are non-plastic.

O. Water. Water shall be free of organic materials and shall have a pH of 7.0 to 9.0, a maximum chloride concentration of 500 mg/L, and a maximum sulfate concentration of 500 mg/L. Provide all water needed for earthwork. Provide temporary piping and valves to convey water from the source to the point of use.

P. Admixtures.

1. Chemical admixtures shall conform to the requirements of SSPWC Section 201-1.2.4, and may consist of air-entraining agents, water-reducing admixtures, and other chemical additives. Chemical admixtures shall be approved by the Engineer.

2. Fly Ash. Fly ash shall conform to the requirements of SSPWC 201-1.2.5, except it shall not be limited to 20 percent by weight of the total cementitious material. Class C fly ash shall not be used.

3. Proportioning. Proportioning shall conform to requirements of SSPWC Section 201-1.3.1. When CLSM is used underneath a paved public right-of-way, the mixture shall contain a minimum of 15 kilograms per cubic meter (25 pounds per cubic yard) of cement when using washed concrete.

2.02 MATERIAL TESTING

A. Preliminary Review of Materials. As stipulated in the Quality Control section, all tests required for preliminary review of materials shall be made by an acceptable independent testing laboratory at the expense of Contractor. Two initial gradation tests shall be made for each type of general fill, designated fill, backfill, or other material, and one additional gradation test shall be made for each additional 100 tons of each material delivered to the jobsite. In addition, one set of initial Atterberg Limits test shall be made for each fill material containing more than 20 percent by weight pass the No. 200 sieve and for materials specified by Atterberg Limits. One additional Atterberg Limits test shall be made for each additional 100 tons of each material delivered to the job site.

B. Field Testing Expense. All moisture-density (Proctor) tests and relative density tests on the materials, and all in-place field density tests, shall be made by an independent testing laboratory at the expense of City. Contractor shall provide access to the materials and work area and shall assist the laboratory as needed in obtaining representative samples.

C. Required Field Tests. For planning purposes, the following guidelines shall be used for frequency of field tests. Additional tests shall be performed as necessary for job conditions and number of failed tests. Test results shall be submitted as indicated in Specification Section 01300, "Submittals".

1. Two moisture-density (Proctor) tests in accordance with ASTM D1557, or two relative density tests in accordance with ASTM D4253 and D4254 for each type of general fill, designated fill, backfill, or other material proposed.

2. For area fills and embankments, an in-place field density and moisture test for each 100 cubic yards of material placed.

3. One in-place field density and moisture test for every 50 to 100 cubic yards of structure backfill or select fill.

4. One in-place density and moisture test whenever there is a suspicion of a change in the quality of moisture control or effectiveness of compaction.

5. At least one test for every full shift of compaction operations on mass earthwork.

6. Additional gradation, proctor, and relative density tests whenever the source or quality of materials changes.

PART 3 EXECUTION

3.01 SITE PREPARATION

A. Clearing and Grubbing. All sites to be occupied by permanent construction or embankments shall be cleared of all logs, trees, roots, brush, tree trimmings, and other objectionable materials and debris. All stumps shall be grubbed. Subgrades for fills and embankments and sites to be occupied by permanent construction shall be cleaned and stripped of all surface vegetation, sod, and organic topsoil. All waste materials shall be removed from the site and disposed of by and at the expense of Contractor.

B. Processing: Existing ground that has been declared satisfactory for support of fill by the Resident Engineer shall be scarified to a minimum depth of 8-inches. Existing ground that is not satisfactory shall be overexcavated as specified in the following section. Scarification shall continue until soils are broken down and free of large clay lumps or clods and the working surface is reasonable uniform, flat, and free of uneven features that would inhibit uniform compaction.

C. Overexcavation: In addition to any removals and overexcavations recommended in the approved grading plan, soft, loose, dry, saturated, spongy, organic rich, highly fractured or otherwise unsuitable ground shall be overexcavated to competent ground as evaluated by the Resident Engineer during grading. Such overexcavations will not result in additional payment to the Contractor.

D. Sufficient earthwork material to complete the Work may not be available at the site. Secure material, as necessary, and required permits to complete the project requirements.

E. Access to the site shall be over public roads and restricted to only those private roads shown on the Plans. Exercise care in the use of such roads and repair any damage caused thereto. Such repair shall be to the satisfaction of the City or agency having jurisdiction over the road. Take whatever means necessary to prevent damage and tracking of mud onto the existing roads and keep roads free of debris.

F. Immediately dispose of excavated materials unsuitable for backfill. Excavated materials suitable for backfill, as determined by the Resident Engineer, may be stored at the site and shaped so as not to interfere with public traffic or to mix with other stockpiled material.

G. Provide adequate facilities for drainage of water from stockpiled excavated material and adequate facilities for handling of storm drainage from the storage area.

H. Evaluation/Acceptance of Fill Areas. All areas to receive fill, including removal and processed areas, key bottoms, and benches shall be observed, mapped, elevations recorded, and/or tested prior to being accepted by the Geotechnical

Consultant as suitable to receive fill. The Contractor shall obtain written acceptance from the Geotechnical Consultant prior to fill placement.

3.02 DEWATERING

A. Provide and operate equipment adequate to keep excavations and trenches free of water. Dewater subgrade to a minimum of 2 feet below bottom of excavation. Remove water continuously during excavation activities during subgrade preparation (and continually thereafter until the structure to be built is completed), the period when concrete is being deposited, when pipe is being laid, and during the placing of backfill/fill material. Avoid settlement or damage to adjacent property. When dewatering open excavations, dewater from outside the structural limits and from a point below the bottom of the excavation. Dispose of water in a manner that will not damage adjacent property and in accordance with permit and specification requirements.

B. Surface water shall be diverted or otherwise prevented from entering excavations or trenches without causing damage to adjacent property.

C. Contractor shall be responsible for the condition of any pipe or conduit used for drainage purposes, and all such pipe or conduit shall be left clean and free of sediment.

3.03 SITE GRADING

A. Perform earthwork to the lines and grades shown in the drawings. Shape, trim, and finish slopes of channels to conform to the lines, grades, and cross sections as shown. Remove exposed roots and loose rocks. Round tops of banks to circular curves of not less than a 6-foot radius. Neatly and smoothly trim round surfaces.

3.04 EXCAVATION

A. General

1. Excavations shall provide adequate working space and clearances for the work to be performed therein and for installation and removal of concrete forms. In no case shall excavation faces be undercut for extended footings.

2. Excavation is unclassified. Perform excavation regardless of the type, nature, or condition of the material encountered to accomplish the construction. Do not operate excavation equipment within 5 feet of existing structures or newly completed construction. Excavate with hand tools in these areas.

3. Sub-grade surfaces shall be clean and free of loose material of any kind when concrete is placed thereon.

4. Except where exterior surfaces are specified to be damp-proofed, monolithic concrete manholes and other concrete structures or parts

thereof, which do not have footings that extend beyond the outside face of exterior walls, may be placed directly against excavation faces without the use of outer forms, provided that such faces are stable and also provided that a layer of polyethylene film is placed between the earth and the concrete.

5. Excavations for manholes and similar structures constructed of masonry units shall have such horizontal dimensions that not less than 6 inches clearance is provided for outside plastering.

6. The contractor will not receive any additional payment for refill material for overexcavation used for his convenience.

B. Classification of Excavated Materials. Classification of excavated materials shall be made as described above in Paragraph 1.08.

C. Preservation of Trees. No trees shall be removed outside excavated or filled areas, unless their removal is authorized by City or shown to be removed. Trees left standing shall be adequately protected from permanent damage by construction operations.

D. Unauthorized Excavation. Except where otherwise authorized, indicated, or specified, all materials excavated below the bottom of concrete walls, footings, slabs on grade, and foundations shall be replaced with concrete or lean concrete at the expense of Contractor. If structural concrete replacement is chosen, it shall be with concrete placed at the same time and monolithic with the concrete foundation. All unauthorized excavation shall be documented and as-built conditions recorded.

E. Blasting will not be permitted.

F. Sheeting and Shoring

1. Except where banks are cut back on a stable slope, excavations for structures and trenches shall be supported as necessary to prevent caving or sliding.

2. Steel sheet piling or other excavation support systems shall be furnished and installed as necessary to limit the extent of excavations for the deeper structures and necessary backfill under adjacent shallower structures, and to protect adjacent structures and facilities from damage due to excavation and subsequent construction. Contractor shall assume complete responsibility for, and install adequate protection systems for prevention of damage to existing facilities.

3. Excavation support systems and sheeting and shoring shall be removed unless otherwise directed by the Resident Engineer.

4. The design of the excavation support system shall be such as to permit complete removal while maintaining safety and stability in the excavation at all times. Sheeting, shoring and excavation support systems shall be designed by a professional civil or structural engineer registered in the State of California. Trenches and excavations shall be designed and constructed in accordance with Occupational Safety and Health Administration (OSHA) regulations and the California Code of Regulations Construction Safety Orders. These regulations provide trench sloping and shoring design parameters for trenches up to 20 feet deep based on the soil types encountered. Trenches over 20 feet deep should be designed by the contractor's professional civil or structural engineer registered in the State of California based on site-specific geotechnical analyses. For planning purposes, the following OSHA soil classifications shall be used:

   a) Fill, Topsoil, Alluvium, Decomposed Granitic Rock Type C Granitic Rock Type B

5. Temporary excavations should be constructed in accordance with OSHA and the California Code of Regulations Construction Safety Orders recommendations. For trench or other excavations, OSHA and the California Code of Regulations Construction Safety Orders requirements regarding personnel safety should be met by using appropriate shoring (including trench boxes) or by laying back the slopes no steeper than 1-1/2:1 (horizontal to vertical) in fill, topsoil, alluvium, and decomposed granitic rock materials and 1:1 in granitic rock. Zones of seepage or perched water may be encountered at shallower depths. Temporary excavations that encounter seepage may need shoring or may be mitigated by placing sandbags or gravel along the base of the seepage zone. Excavations encountering seepage should be evaluated on a case-by-case basis. Dewatering is not anticipated to be needed in the performance of the overexcavation for the proposed pads. On-site safety of personnel is the responsibility of the contractor.

G. Stabilization. Sub-grades for concrete structures shall be firm, dense, and thoroughly compacted and consolidated; shall be free from mud and muck; and shall be sufficiently stable to remain firm and intact under the feet of the workers. The contractor shall maintain subgrade stability and protect subgrades from adverse effects prior to backfilling. Unstable bottom conditions may be mitigated by overexcavating the bottom approximately 1 foot and replacing with crushed rock. Recommendations for stabilizing excavation bottoms should be based on evaluation in the field at the time of construction.

H. Roadway Excavation. Excavation for the roadways, drives, and parking areas shall conform to the lines, grades, cross sections, and dimensions indicated on the drawings and shall include the excavation of all unsuitable material from the subgrade. After shaping to line, grade, and cross section, the subgrade shall be compacted to a depth of at least 12 inches and shall meet the following:

Test method to determine maximum density and moisture.	ASTM 1557.

Relative compaction	95%.
Moisture content relative to the optimum.	0% to +3%.

I. This operation shall include any reshaping and wetting or drying required to obtain proper compaction. All soft or otherwise unsuitable material shall be removed and replaced with suitable material.

3.05 FILLS AND EMBANKMENTS

A. All fills and embankments shall be constructed to the lines and grades indicated on the drawings. Backfill materials shall be deposited in layers not to exceed 8 inches in uncompacted thickness. Unless otherwise specified herein, the following governing standards apply:

Test method to determine maximum density and moisture.	ASTM D1557.
Relative compaction	90%.
Moisture content relative to the optimum.	-2% to +2%.
Relative compaction upper 12-inches of subgrade	95%

B. Sub-grade Preparation

1. After preparation of the fill or embankment site, the sub-grade, if soil, shall be scarified and moisture conditioned to a minimum depth of 8 inches, leveled and rolled so that surface materials of the sub-grade will be at a moisture content and as compact and well bonded with the first layer of the fill or embankment as specified for subsequent layers.

2. Unless otherwise directed by Engineer, the sub-grade shall be proof-rolled by a rubber-tired roller, a loaded dump truck, or other suitable rubber-tired equipment acceptable to Engineer. A minimum of four passes of the proof-rolling equipment shall be provided such that the last two passes are made perpendicular to the first two passes.

3. All soft, yielding, or otherwise unsuitable material shall be removed and replaced with compacted fill at the Contractor's own expense.

C. Placement and Compaction

1. When placing fill on slopes steeper than 5 horizontal to 1 vertical the fill against the slope shall be placed by cutting horizontal benches into the slope with the height of each bench about 3 to 4 feet unless otherwise directed by the Engineer. All fill and embankment materials shall be placed in approximately horizontal layers not to exceed 8 inches in un-compacted thickness. Material deposited in piles or windrows by excavating and hauling equipment shall be spread and leveled before compaction. Fill placement shall begin at the lowest level and progress upward.

2. Each layer of material shall have the best practicable moisture content for satisfactory compaction. The material in each layer shall be wetted or dried

to achieve the moisture content relative to optimum as specified above, and shall be thoroughly mixed to ensure uniform moisture content and adequate compaction. Each layer shall be thoroughly compacted to the required degree of compaction at the required moisture content. If the material fails to meet the density specified, compaction methods shall be altered. The changes in compaction methods shall include, but not be limited to, changes in compaction equipment, reduction in uncompacted lift thickness, increase in number of passes, and better moisture control.

3.06 STRUCTURE FOUNDATION PREPARATION

A. Excavation. Excavation below proposed foundations and slabs-on-grade for structures shall consist of removing all loose, soft or otherwise unsuitable material to expose competent decomposed or less weathered granitic bedrock to the depths determined by Engineer. Excavation shall be performed using methods and equipment that prevent disturbance of the bearing materials. When using ripper tooth for excavation, the ripper tooth penetration shall be controlled to prevent penetration below the structure bearing levels. Should bearing materials become disturbed due to excavation operations, they shall be removed to the level of undisturbed subgrade to the satisfaction of Engineer at no additional cost to City.

1. Retaining Wall, Pump Station, and Generator Excavation and Foundation Preparation. Unsuitable material i.e., existing fill, topsoil, and alluvium and loose decomposed granite be removed to expose competent decomposed granite or granitic rock within structural areas. Structural areas are defined as the areas underlying the structures and extending a horizontal distance of 5 feet beyond the footprints of the structures. The depth and extent of the removal should be observed in the field by the Resident Engineer.

2. Backfill and compaction of over-excavation zones shall be in accordance with Paragraph 3.05.

B. Limits of Excavation. Unless otherwise indicated on the drawings, excavation of unsuitable materials shall extend beyond the edge of the footing a distance equal to the depth of overexcavation below the bottom of the footing or 3 feet, whichever is greater. In no case, however, shall proposed excavations undermine existing foundations. Foundations and slabs of existing structures shall be positively supported by means suitable to prevent damage to structures.

C. Damage to existing structures as a result of the Contractor's operations shall be corrected by the Contractor to the satisfaction of Engineer at no additional cost to the City. The Contractor shall adequately survey the condition of the structure in the work area and provide a written report to Engineer prior to excavation.

D. Subgrade Preparation. Prior to placing fills below footings and slabs and any filter fabric and granular fill or CLSM as indicated on the drawings, the subgrade shall be tested for soft, loose, or unsuitable soils by the Engineer. A 48-hour notice shall be provided for subgrade inspection to the Engineer.

E. Construction Requirements. Soil subgrades for structures and fills shall be periodically sprinkled with water to prevent desication. Should soil subgrades become desiccated, they shall be removed and replaced; soaked or; scarified, moisture conditioned and recompacted as specified herein to provide a subgrade within the specified moisture and compaction limits. Any soft areas which develop due to excessive moisture increase shall be dried out or removed prior to placing additional lifts or concrete. Rock subgrades approved for placement of CLSM shall be protected from deterioration due to exposure to elements until covered with CLSM or concrete. Deteriorated subgrade shall be removed and replaced with CLSM at Contractor's expense.

3.07 FINAL GRADING AND PLACEMENT OF TOPSOIL

A. After other outside work has been finished, and backfilling and embankments completed and settled, all areas which are to be graded shall be brought to grade at the indicated elevations, slopes, and contours. All cuts, fills, embankments, and other areas which have been disturbed or damaged by construction operations shall be surfaced with topsoil to a depth of 4 inches. Topsoil shall be of a quality at least equal to the existing topsoil in adjacent areas, free from trash, stones, and debris, and well suited to support plant growth.

B. Use of graders or other power equipment will be permitted for final grading and dressing of slopes, provided the result is uniform and equivalent to manual methods. All surfaces shall be graded to secure effective drainage. Unless otherwise indicated, a slope of at least 1 percent shall be provided.

C. Final grades and surfaces shall be smooth, even, and free from clods and stones, weeds, brush, and other debris.

3.08 DISPOSAL OF EXCAVATED MATERIALS

A. To the maximum extent available, suitable excavated materials may be used in fills and embankments provided it meets the requirements specified. This will require the material to be tested by the City's geotechnical consultant at the Contractor's expense. All excavated material unsuitable for use, as determined by the City's geotechnical consultant, shall be disposed of off-site at the expense of Contractor.

B. All debris, stones, logs, stumps, roots, trash and other unsuitable materials shall be removed from the site and disposed of by, and at the expense of, Contractor.

C. Immediately dispose of excavated materials. Materials generated at sites shall be disposed of at locations selected by the Contractor.

D. Obtain a release from individual property owners absolving the City from any and all responsibility in connection with the disposal of such material.

E. Haul excavated materials from the work site to approved disposal locations during the hours permitted in accordance with local traffic control regulations. Provide

traffic control as required by the agency having jurisdiction. Material may be stockpiled temporarily at locations on the work site if approved in writing by the Engineer.

3.09 SETTLEMENT

A. Contractor shall be responsible for all settlement of backfill, fills, and embankments which may occur within the correction period.

B. Contractor shall make, or cause to be made, all repairs or replacements made necessary by settlement within 30 days after notice from the City.

END OF SECTION

SECTION 02834
HIGH SECURITY STEEL FENCING AND GATES

PART 1 GENERAL

1.01 WORK INCLUDED

A. The Contractor shall provide all labor, materials and appurtenances necessary for installation of the coated steel pale security fence system defined herein.

1.02 RELATED WORK

Section 02200 - Earthwork

Section 02835 - High Security Steel Roll Gate System

Section 03300 - Cast-in-Place Concrete

1.03 SYSTEM DESCRIPTION

A. The manufacturer shall supply a steel ornamental pale high security fence system. The system shall include all components (i.e., pales, rails, posts, gates and hardware) required.

1.04 QUALITY ASSURANCE

A. The Contractor shall provide laborers and supervisors who are thoroughly familiar with the type of construction involved and materials and techniques specified.

1.05 REFERENCES

ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process.

ASTM B117 - Practice for Operating Salt-Spray (Fog) Apparatus.

ASTM D523 - Test Method for Specular Gloss.

ASTM D714 - Test Method for Evaluating Degree of Blistering in Paint.

ASTM D822 - Practice for Conducting Tests on Paint and Related Coatings and Materials using Filtered Open-Flame Carbon-Arc Light and Water Exposure Apparatus.

ASTM D1654 - Test Method for Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments.

ASTM D2244 - Test Method for Calculation of Color Differences from Instrumentally Measured Color Coordinates.

ASTM D2794 - Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact).

ASTM D3359 - Test Method for Measuring Adhesion by Tape Test.

ASTM F2408 – Ornamental Fences Employing Galvanized Steel Tubular Pickets.

1.06 SUBMITTAL

A. The manufacturer's submittal package shall be provided in accordance with Specification Section 01300, "Submittals" and, at a minimum, shall include the following

1. Fence frame and picket materials
2. Hardware
3. Manufacturer's printed installation instructions
4. Coating materials
5. Warranty

1.07 PRODUCT HANDLING AND STORAGE

A. Upon receipt at the job site, all materials shall be checked to ensure that no damage occurred during shipping or handling. Materials shall be stored in such a manner to ensure proper ventilation and drainage, and to protect against damage, weather, vandalism and theft.

1.08 PRODUCT WARRANTY

A. All structural fence components (i.e. rails, pickets, and posts) shall be warranted within specified limitations, by the manufacturer for a period of 15 years from date of original purchase. Warranty shall cover any defects in material finish, including cracking, peeling, chipping, blistering or corroding.

PART 2 MATERIALS

2.01 MANUFACTURER

A. The steel ornamental pale high security fence system shall conform to Ameristar Impasse II (Gauntlet) (specify 2-Rail) style manufactured by Ameristar Fence Products, Inc., in Tulsa, Oklahoma, or City approved equal.

2.02 MATERIAL

A. Steel material for fence framework (i.e., corrugated pales, rails and posts), when galvanized prior to forming, shall conform to the requirements of ASTM A924/A924M, with a minimum yield strength of 45,000 psi. The steel shall be hot-dip galvanized to meet the requirements of ASTM A653/A653M with a minimum zinc coating weight of 0.90 oz/ft2, Coating Designation G-90.

B. Material for corrugated pales shall be a nominal 2.75" x .75" x 14 Ga. The cross-sectional shape of the rails shall conform to the manufacturer's rail design a nominal 2" x 2" x 11 Ga. Pre-drilled holes in the rail shall be spaced 6" on center, providing a pale airspace of no greater than 3.25". Tamperproof fasteners shall be used to fasten each pale to rail at every intersection. Posts shall conform to the manufacturer's I-Beam design with a nominal 3" x 2.75" x 12 Ga. for fence panel heights up to & including 8' height and/or I-Beam design with a nominal 4" x 2.75" x 11 Ga. for fence heights greater than 8' up to 10' panel height. Fence posts and gate posts shall meet the minimum size requirements of Table 1.

2.03 FABRICATION

A. Pales, rails and posts shall be pre-cut to specified lengths. Rails shall be pre-punched to accept tamperproof security fasteners. Post flange shall be pre-punched to accept rail to post attachment. Post web shall be punched providing a clear opening for interior of rails to align throughout the entire system for affixing conduit, video cabling, IDS wiring, and other components for a complete systems integration. Rails shall be attached to post flange providing a bracket-less design at each intermediate post.

B. The manufactured galvanized framework shall be subjected to the PermaCoat® thermal stratification coating process (high-temperature, in-line, multi-stage, multi-layer) including, as a minimum, a six-stage pretreatment/wash (with zinc phosphate), an electrostatic spray application of an epoxy base, and a separate electrostatic spray application of a polyester finish. The base coat shall be a thermosetting epoxy powder coating (gray in color) with a minimum thickness of 2 mils (0.0508mm). The topcoat shall be a "no-mar" TGIC polyester powder coat finish with a minimum thickness of 2 mils. The color shall be Black. The stratification-coated framework shall be capable of meeting the performance requirements for each quality characteristic shown in Table 2.

C. Completed panels shall be capable of supporting a 400 lb. load (applied at midspan) without permanent deformation. Panels shall be biasable to a 30° change in grade.

D. Swing gates shall be fabricated using 2" sq. x 11ga rail, 2" sq. x 11ga. gate ends, and 2.75" x .75" x 0.075 pales. Gates that exceed 6' in width will have a 2" sq. x 11ga. intermediate upright. All rail and upright intersections shall be joined by welding. All pale and rail intersections shall also be joined by welding.

E. Sliding cantilever gates shall be TransPort IS design matching style, height, and color of fence system. The dual enclosed track slide gate shall be an aluminum component design using tracks, uprights, pales, hardware, fittings, and fasteners. Gate installation shall comply with latest ASTM F2200 standards for automated gates, regardless if the gate is of manual operation.

PART 3 EXECUTION

3.01 PREPARATION

A. All new installation shall be laid out by the Contractor in accordance with the construction plans.

3.02 FENCE INSTALLATION

A. Fence post shall be spaced according to Table 3, plus or minus ¼". For installations that must be raked to follow sloping grades, the post spacing dimension must be measured along the grade. Fence panels shall be attached to the line and end posts with fasteners supplied by the manufacturer. Attachment to corner post shall be made using brackets and fasteners supplied by the manufacturer (See Figure 1). Posts for fence and gates shall be set in concrete footers (520-C-3250) having a minimum depth of 36".

3.03 FENCE INSTALLATION MAINTENANCE

A. When cutting/drilling rails or posts adhere to the following steps to seal the exposed steel surfaces; 1) Remove all metal shavings from cut area. 2) Apply zinc-rich primer to thoroughly cover cut edge and/or drilled hole; let dry. 3) Apply 2 coats of custom finish paint matching fence color. Failure to seal exposed surfaces per steps 1-3 above will negate warranty. Ameristar spray cans or paint pens shall be used to prime and finish exposed surfaces; it is recommended that paint pens be used to prevent overspray.

3.04 GATE INSTALLATION.

A. Gate posts shall be spaced according to the manufacturers' gate drawings, dependent on standard out-to-out gate leaf dimensions and gate hardware selected. Type and quantity of gate hinges shall be based on the application; weight, height, and number of gate cycles. The manufacturers' gate drawings shall identify the necessary gate hardware required for the application. Gate hardware shall be provided by the manufacture of the gate and shall be installed per manufacturer's recommendations.

3.05 CLEANING.

A. The Contractor shall clean the jobsite of excess materials; post-hole excavations shall be scattered uniformly away from posts.

Table 1 – Minimum Sizes for Posts	
Fence Posts (Nominal)	Panel Height
3" x 2.75" x 12 Ga. I-Beam	Up to & Including 8' Height
4" x 2.75" x 11 Ga. I-Beam	Over 8' Height up to & including 10' Height

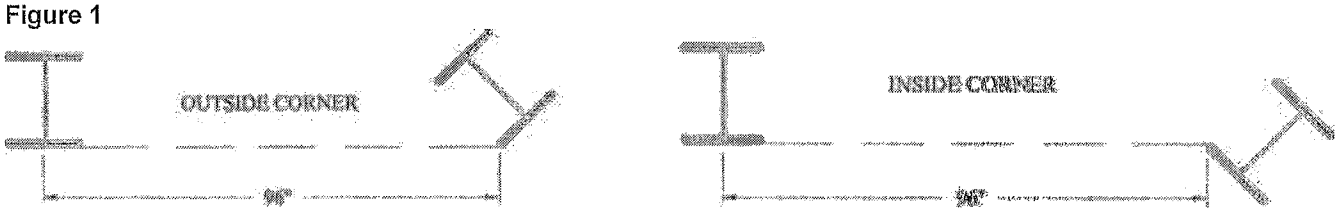
Gate Leaf	Gate Height			
	Up to & Including 6'	Over 6' Up to & Including 8'	Over 8' Up to & Including 10'	Over 12'
Up to 4'	3" x 12Ga.	3" x 12 Ga.	4" x 11 Ga.	4" x 11 Ga.
4'1" to 6'	3" x 12Ga.	3" x 12 Ga.	4" x 11 Ga.	4" x 11 Ga.
6'1" to 8'	4" x 11 Ga.	6" x 3/16"	6" x 3/16"	6" x 3/16"
8'1" to 10'	4" x 11 Ga.	6" x 3/16"	6" x 3/16"	6" x 3/16"
10'1" to 12'	6" x 3/16"	6" x 3/16"	6" x 3/16"	8" x 1/4"
12'1" to 16'	6" x 3/16"	6" x 3/16"	8" x 1/4"	8" x 1/4"

Table 2 – Coating Performance Requirements		
Quality Characteristics	ASTM Test Method	Performance Requirements
Adhesion	D3359 – Method B	Adhesion (Retention of Coating) over 90% of test area (Tape and knife test).
Corrosion Resistance	B117, D714 & D1654	Corrosion Resistance over 3,500 hours (Scribed per D1654; failure mode is accumulation of 1/8" coating loss from scribe or medium #8 blisters).
Impact Resistance	D2794	Impact Resistance over 60 inch lb. (Forward impact using 0.625" ball).
Weathering Resistance	D822 D2244, D523 (60° Method)	Weathering Resistance over 1,000 hours (Failure mode is 60% loss of gloss or color variance of more than 3 delta-E color units).

Table 3 – Post Spacing		
Span	8' Nominal (95" Rail)	
	Line & End Posts	
Post Size	3" x 2.75" x 12 Ga. I-Beam	4" x 2.75" x 11 Ga. I-Beam
Post Settings ± ¼" O.C.	96"	96"

**For Corner Posts see Figure 1*

Figure 1



END OF SECTION

SECTION 02835
HIGH SECURITY STEEL ROLL GATE SYSTEM

PART 1 GENERAL

1.01 WORK INCLUDED

A. The contractor shall provide all labor, materials and appurtenances necessary for installation of the high security steel roll gate system defined herein.

1.02 RELATED WORK

Section 02200 – Earthwork

Section 02834 – High Security Steel Fencing and Gates

Section 03300 – Cast-in-Place Concrete

1.03 SYSTEM DESCRIPTION

A. The manufacturer shall supply a total roll gate system of Ameristar® PassPort IS® (Impasse Security) design series and (Gauntlet) style, or approved equal. The system shall include all components (i.e., pales, rails, gate uprights, wheels and hardware) required. The gate operator, key pad, transmitters, motor, and loop detectors shall be by Door King, or City approved equal, as defined herein.

1.04 QUALITY ASSURANCE

A. The contractor shall provide laborers and supervisors who are thoroughly familiar with the type of construction involved and materials and techniques specified.

1.05 REFERENCES

ASTM B117 - Practice for Operating Salt-Spray (Fog) Apparatus.

ASTM D523 - Test Method for Specular Gloss.

ASTM D714 - Test Method for Evaluating Degree of Blistering in Paint.

ASTM D822 - Practice for Conducting Tests on Paint and Related Coatings and Materials using Filtered Open-Flame Carbon-Arc Light and Water Exposure Apparatus.

ASTM D1654 - Test Method for Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments.

ASTM D2244 - Test Method for Calculation of Color Differences from Instrumentally Measured Color Coordinates.

ASTM D2794 - Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact).

ASTM D3359 - Test Method for Measuring Adhesion by Tape Test.

1.06 SUBMITTAL

The manufacturer's submittal package shall be provided for approval in accordance with Specification Section 01300, "Submittals". In addition, the following specific information shall be submitted.

A. Shop Drawings and Catalog Data

1. Data for the roll gate, motorized gate operator, detector loops, and card reader system

2. Scaled drawing of the gate access system, electrical connections and gate operator pad

3. Materials of construction.

B. Operation and Maintenance Manuals

1. O&M manuals shall be furnished for the equipment herein specified in accordance with Specification Section 01730, "Operations and Maintenance Manuals".

1.07 PRODUCT HANDLING AND STORAGE

A. Upon receipt at the job site, all materials shall be checked to ensure that no damages occurred during shipping or handling. Materials shall be stored in such a manner to ensure proper ventilation and drainage and to protect against damage, weather, vandalism and theft.

PART 2 MATERIALS

2.01 SLIDING GATE

A. MANUFACTURER. The steel roll gate system shall conform to Ameristar PassPort IS (Impasse Security) design series, (Gauntlet) style and (2-rail) frame configuration manufactured by Ameristar Fence Products, Inc. in Tulsa, Oklahoma, or City approved equal. Sliding gate shall be a powder coated, black steel rolling gate produced by a firm experienced in producing ornamental fences and gates with a record of successful in-service performance, as well as sufficient production capacity to produce the required units. Powder-coating applicator shall be a firm experienced in successfully applying powder coatings and employing competent control personnel to conduct continuing, effective quality control to ensure compliance with requirements.

B. Gate and High Security fencing provided under Specification Section 02834, "High Security Steel Fencing and Gates" shall be furnished by the same manufacturer.

C. MATERIAL

1. Steel material for roll gate components (i.e. pales, rails, diagonals and uprights), shall be commercial steel with minimum yield strength of 45,000 psi.

2. Ornamental pale material shall be 2-3/4" wide x 3/4" corrugated pales. Pale spacing shall be 6". Material for toprails, uprights and diagonals rails shall be 2" square x 12 Ga. Material for the bottom rail shall be 2" x 4" x 11 Ga. Posts shall be a minimum of 4" square x 11 Ga.

3. Provide tamper resistant fasteners.

4. V-Track shall be one-piece galvanized steel and set in concrete (not bolted). Gate wheel to be commercial grade and to have ball-type stainless steel rollers.

5. Include hardware, posts and other features to prevent gate from being lifted off track and opened in an unintended manner.

D. FABRICATION

1. Pales, rails, uprights and posts shall be precut to specified lengths. Diagonals shall be precut to specified lengths and angles. Frame materials shall be joined by welding. Pales shall be face welded to roll gate frame, except for Invincible or Gauntlet style gates over 18' long. Invincible or Gauntlet style gates over 18' long shall have pales face-welded to 2" x 2" angle iron to form panels equal in length to the gate frame bay width.

2. The manufactured roll gates and bolt-on panels (if applicable) shall be subjected to the PermaCoat® thermal stratification coating process (high-temperature, in-line, multi-stage, multi-layer) including, as a minimum, a six-stage pre-treatment/wash (with zinc phosphate), an electrostatic spray application of an epoxy base, and a separate electrostatic spray application of a polyester finish. The base coat shall be a thermosetting epoxy powder coating (gray in color) with a minimum thickness of 2 mils. The topcoat shall be a "no-mar" TGIC polyester powder coat finish with a minimum thickness of 2 mils. The color shall be Black. The stratification-coated framework shall be capable of meeting the performance requirements for each quality characteristic shown in Table 1.

3. Completed gates shall be capable of supporting a 200 lb. load applied at midspan without permanent deformation.

2.02 SLIDE GATE OPERATOR

A. System shall be DoorKing, Inc. of Inglewood, California or City approved equal and specifically designed to operate with the high security rolling gate specified above and indicated on the drawings. The Contractor shall be responsible for a complete, integrated and operable system. All equipment shall be commercial grade, new, in current production, and the standard products of Door King gate operator equipment.

1. Door King Programmable Key Pad with a keyed 'hold open' switch and knoxbox mounted on the gate controller pedestal as indicated on the drawings. Integrate the City's access card system to activate the gate operator from close proximity to the card reader. A swipe-type card reader is not acceptable. Provide and install Complete Reverse Loop inside and outside with Open Loop on Exit of Gate (two safety loops and one exit loop cut-in and sealed in the asphalt.

2. Mega Code Receiver (SMDRG) and Three Mega Code Transmitters.

3. Appropriately sized motor for size and weight of gate. Motor to be mounted in a metal, outdoor weatherproof enclosure on a concrete pad.

4. Operator shall be UL 325 and UL 991 listed for a Class II location. Operator shall be rated for continuous duty operation with limit switches and electronic clutch which shall sense an obstacle to gate travel. Provide electrical system and components as indicated on the electrical drawings and as specified in Division 16.

5. Chain shall be stainless steel.

6. Loop detectors shall be plug-in type by Door King.

PART 3 EXECUTION

3.01 PREPARATION

A. All new installation shall be laid out by the contractor in accordance with the construction plans.

3.02 INSTALLATION.

A. SLIDE GATE: Gateposts shall be set in concrete (520-C-3250) in accordance with the spacing's shown in the construction plans. 6" wheels shall be bolted to the gate (between the wheel plates welded near the ends of the gate bottom rail). The gate shall be set upright with the V-grooved wheels positioned over the pre-installed steel V-track that traverses the gate opening. Roller guides shall be affixed to the gateposts at a height even with the gate toprail to hold the gate in a vertical position. Gate stops shall be welded to the end of the gate or track so gate cannot pass rollers in either direction.

B. SLIDE GATE OPERATOR: Install the slide gate operator in accordance with the manufacturer's installation instructions and in accordance with below. Installation shall comply with all applicable codes.

1. System shall be installed by a factory authorized contractor with technicians specifically trained in the system.

2. All necessary conduit, raceways and pull boxes shall be installed by the contractor.

3. Include plans, elevations, component details and attachments to other work. Metal member, fittings, joinery, finishes, fasteners, anchorages, and accessory items will be of commercial grade or better. Roller wheels will be heavy duty wheels verses standard maintenance wheels.

4. Verify actual locations of walls and other construction contiguous with gate by field measurements before fabrication and indicate measurements on shop drawings. Provide allowance for trimming and fitting at the site.

5. Coordinate installation of anchorages, anchor bolts, and items with integral anchors cast into concrete pad.

3.03 CLEANING

A. The contractor shall clean the jobsite of excess materials; post hole excavations shall be scattered uniformly away from posts.

Table 1 – Coating Performance Requirements

Quality Characteristics	ASTM Test Method	Performance Requirements
Adhesion	D3359 – Method B	Adhesion (Retention of Coating) over 90% of test area (Tape and knife test).
Corrosion Resistance	B117, D714 & D1654	Corrosion Resistance over 1,000 hours (Scribed per D1654; failure mode is accumulation of 1/8" coating loss from scribe or medium #8 blisters).
Impact Resistance	D2794	Impact Resistance over 60 inch lb. (Forward impact using 0.625" ball).
Weathering Resistance	D822 D2244, D523 (60° Method)	Weathering Resistance over 1,000 hours (Failure mode is 60% loss of gloss or color variance of more than 3 delta-E color units).

END OF SECTION

SECTION 03100
CONCRETE FORMWORK

PART 1 GENERAL

1.01 SCOPE

A. This section covers formwork for cast-in-place concrete.

1.02 GENERAL

A. All forms shall be accurately and properly placed so cast-in-place concrete may be placed as indicated on the design drawings and as specified. The forms shall produce a smooth concrete finish free from offsets or irregularities.

1.03 SUBMITTALS

A. All submittals of catalog data sheets, manufacturers' certificates of compliance and other data shall be in accordance with the Submittals section.

B. A manufacturer's certificate of compliance, which includes the name of the project and, when requested, copies of independent test results confirming compliance with specified requirements, shall be submitted to Engineer for the following materials:

1. Form Coating: Form Ties

PART 2 PRODUCTS

2.01 MATERIAL

1. Forms Prefabricated: Simplex "industrialSteel Frame Forms" "Steel Ply", or Universal "Uni-Form".
2. Plywood: Product Standard PS1 waterproof resin bonded exterior type Douglas fir face adjacent to concrete Grade B or better.
3. Fiberboard" ANSI/AHA A135.4, Class 1 tempered, water-resistant, concrete from hardboard.
4. Chamfer Strips: Clear white pine, surface against concrete planed.
5. Form Coating; Nonstaining and nontoxic after 30 days, VOC-compliant, Burke "Form Release (WB)", L&M Chemical "EZ Strip", Nox-Crete "From-Coating" or Symons "Thirft Kote WB"

2.02 FORMS

A. Forms shall be designed to produce hardened concrete having the shape, lines, and dimensions indicated on the drawings. Forms shall conform to ACI 347 and the following additional requirements.

B. Forms for surfaces which will be exposed to view after construction is completed shall be constructed of prefabricated plywood panels, job-built of plywood, or lined with plywood or fiberboard. Forms for exposed surfaces shall be laid out in a regular and uniform pattern with the long dimension of panels vertical and all joints aligned. The forms shall produce finished surfaces that are free from offsets, ridges, waves, and concave or convex areas, within the tolerances specified herein.

C. Plywood or lined forms will not be required for surfaces which are normally submerged or not ordinarily exposed to view, such as the interior of manholes, basins, and reservoirs. Other types of forming materials, such as steel or unlined wood, may be used where plywood or lined forms are not required and may be used as backing for form linings.

D. Il vertical concrete surfaces above footings shall be formed.

E. Flat segmented forms not more than 24 inches wide may be used for forming curved surfaces 25 feet in diameter or larger.

2.03 DESIGN

A. Forms shall be substantial and sufficiently tight to prevent leakage of mortar. Forms shall be braced or tied to maintain the desired position, shape, and alignment during and after concrete placement. Walers, studs, internal ties, and other form supports shall be sized and spaced so that permissible working stresses are not exceeded.

2.04 FORM TIES

A. Form ties shall have removable end and permanently embedded body, and shall have sufficient strength and rigidity to support and maintain the form in proper position and alignment without the use of auxiliary spreaders. Cones shall be provided on the outer ends of each tie, and the permanently embedded portion shall be at least 1 inch back from the concrete face. Permanently embedded portions of form ties without threaded ends shall be constructed so that the removable ends are readily broken off without damage to the concrete. Through-wall tapered removable ties will not be acceptable. The type of form ties used shall be acceptable to Engineer.

B. Form ties in exposed surfaces shall be uniformly spaced and aligned in horizontal and vertical rows.

2.05 EDGES AND CORNERS

A. Chamfer strips shall be placed in forms to bevel all salient edges and corners, except the top edges of walls and slabs which are to be tooled and edges which are to be buried. Equipment bases shall have formed beveled salient edges for all vertical and horizontal corners, unless specifically indicated otherwise on the drawings. Unless otherwise noted, bevels shall be 3/4 inch wide.

PART 3 EXECUTION

3.01 PLACEMENT

A. The limits of each concrete pour shall be determined by Contractor and shall be acceptable to Engineer.

B. Before concrete is placed, forms shall be rigidly secured in proper position; all dirt, mud, water, and debris shall be removed from the space to be occupied by concrete; all surfaces encrusted with dried concrete from previous placements shall be cleaned; and the entire installation shall be acceptable to Engineer. Remove all frost, ice, and snow from within the formwork before concrete is placed.

3.02 TOLERANCES

A. Tolerances for cast-in-place concrete work shall be as stipulated in ACI 117, unless otherwise indicated. Formed surfaces stipulated in Article 3.4 of ACI 347 shall be considered Class A for architectural concrete and Class C for all other concrete work.

3.03 FORM COATING

A. All concrete forms shall have form release agent applied to them before placement of concrete.

3.04 FORM REMOVAL

A. Forms shall not be removed from structures until the concrete in the structures has sufficient strength to support the weight of the structure and any superimposed load, including loads from construction operations. CONTRACTOR shall be responsible for limiting any applied loadings. There shall be no evidence of damage to concrete and no excessive deflection or distortion of members due either to the removal of forms or to loss of support.

B. Supporting formwork shall not be removed from horizontal members until the concrete has attained at least 75 percent of the specified 28 day compressive strength as determined by cylinders made and cured in the field. Shores shall not be removed before concrete has attained 28 day compressive strength as specified in the Cast-in-Place Concrete section. Shoring shall be left in place and reinforced as necessary to carry any construction equipment or materials placed thereon.

C. When forms are removed before the specified curing is completed, measures shall be taken to immediately continue curing and to provide adequate thermal protection for the concrete.

END OF SECTION

SECTION 03200
CONCRETE REINFORCEMENT

PART 1 GENERAL

1.01 SCOPE

A. This section covers reinforcement for cast-in-place and precast concrete.

1.02 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. The publications listed below form part of this specification to the extent referenced and are referred to in the text by the basic designation only. Reference shall be made to the latest edition of said standards unless otherwise called for.

1. Commercial Standards:

a) ACI 301 Structural Concrete for Buildings

b) ACI 315 Details and Detailing of Concrete Reinforcement

c) ACI 318 Concrete Reinforcing Steel Institute Manual of Standard Practice

d) WRI Manual of Standard Practice for Welded Wire Fabric

e) AWA D1.4 Structural Welding Code – Reinforcing Steel

f) ASTM A 82 Specification for Welded Steel Wire, Plain, for Concrete Reinforcement

g) ASTM A 185 Specification for Welded Steel Wire Fabric, Plain, for Concrete Reinforcement

h) ASTM A 615 Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement

i) ASTM A 706 Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement.

j) AWS D1.4 Structural Welding Code for Reinforcing Steel.

1.03 SUBMITTALS

A. Drawings and Data. All submittals of drawings, manufacturers' certificates of compliance, certification of reinforcement, reinforcement bar lists, placement drawings, test data, catalog data sheets and other data shall be in accordance with the Submittals section.:

B. Bar lists and drawings for the fabrication and placing of reinforcement shall be submitted for review and shall have sufficient plans, elevations, and sections to

adequately detail and label all reinforcement. The bar lists and drawings shall also include a reference to the structure in which the reinforcement will be installed and to the project drawing showing the reinforcement.

C. Manufacturer's Certificate of Compliance. A manufacturer's certificate of compliance, which includes the name of the project and, when requested, copies of independent test results confirming compliance with specified requirements, shall be submitted to Engineer for the following materials:

1. Mechanical connections.

2. Welding.

D. Contractor shall submit all reinforcing for a given structure in a single submittal at one time. Partial reinforcing submittals may be returned to the Contractor rejected for incompleteness.

1.04 QUALITY ASSURANCE

A. If requested by the Engineer, the Contractor shall provide samples from each heat of reinforcement steel delivered in a quality adequate for testing. Costs of tests will be paid by the Contractor.

B. If reinforcement steel is spliced by welding at any location, the Contractor shall submit certifications of procedure qualifications for each welding procedure used and certification of welder qualifications, for each welding procedure, and for each welder performing the work. Such qualifications shall be as specified in AWS D1.4.

C. If requested by the Engineer, the Contractor shall provide samples of each type of welded splice used in the work in a quantity and of dimensions adequate for testing. At the discretion of the Engineer, radiographic testing of direct butt welded splices will be performed. The Contractor shall provide assistance necessary to facilitate testing. The Contractor shall repair any weld which fails to meet the requirements of AWA D1.4. The costs of testing will be paid by the Contractor.

D. Inspection. All work hereunder shall be subject to continuous inspection by a Special Inspector selected by the Owner and approved by the City of San Diego. Special Inspection shall be performed in accordance with the 2013 edition of the California Building Code. The Special Inspector shall work under the direct supervision of the Engineer. All costs of such inspection shall be borne by the Contractor and shall be included in the price bid for completion of the work.

E. The Special Inspector shall observe the following work for conformance with the design drawings and specifications: During placing of all reinforcing steel in concrete requiring special inspection; during the welding of all reinforcing steel.

PART 2 PRODUCTS

2.01 MATERIAL REQUIREMENTS

A. Materials specified in this Section which may remain or leave residues on or within the concrete shall be classified as acceptable for potable water use within 30 days of application or use by the Environmental Protection Agency.

2.02 MATERIALS

1. Bars, Except Weldable: ASTM A615, Grade 60, deformed.

2. Bars, Weldable: ASTM A706, Grade 60, deformed, with maximum carbon equivalent of 0.55%.

3. Welded Wire Fabric: ASTM A185 or A497

4. Bar Supports: CRSI Class 1, plastic protected; or Class 2, stainless steel protected.

5. Mechanical Connections: Classified Type 2 per ACI 318. Dayton/Richmond "Dowel Bar Splicer" or "Coupler Splice" System, Bar-Lock "Coupler Systems" or Barsplice Products or Lenton by Erico.

6. Protective Tape Wrap: Tapecoat "Tapecoat 20"

2.03 REINFOREMENT

A. Reinforcement shall be accurately formed and shall be free from loose rust, scale, concrete splatter, and contaminants which reduce bond. Unless otherwise indicated on the drawings or specified herein, the details of fabrication shall conform to ACI 315 and ACI 318.

1. Splices. Splices shall conform to the details indicated on the drawings. Splices at locations other than those indicated on the drawings shall be submitted to Engineer for review and concurrence.

2. Mechanical Connections. Mechanical connections shall be used only as indicated on the drawings. Connections in adjacent bars shall be spaced at least 30 inches apart.

3. Welding. Except where indicated on the drawings, welding or tack welding of reinforcement is not permitted. Preheating and welding shall conform to AWS D1.4. Reinforcement which has been welded improperly or without Engineer's concurrence shall be removed and replaced.

4. Epoxy Grout. Epoxy for grouting reinforcing bars shall be specifically formulated for such application, for the moisture condition, application temperature, and orientation of the hole to be filled. Epoxy grout shall meet the requirements found in the Grout Section 03600.

PART 3 EXECUTION

3.01 STORAGE AND HANDLING

A. Reinforcing steel shall be carefully handled and shall be stored on supports which prevent the steel from touching the ground.

3.02 FABRICATION

A. General:

1. Reinforcement steel shall be accurately formed to the dimensions and shapes shown, and the fabricating details shall be prepared in accordance with ACI 315 and ACI 318, except as modified by the Drawings. Stirrups and tie bars shall be bent around a pin having diameter not less than 1-1/2-inch for No. 3 bars, 2-inch for No. 4 bars, and 2-1/2-inch for No. 5 bars. Bends for other bars shall be made around a pin having a diameter not less than 6 times the bar diameter, except for bars larger than 1 inch, in which case the bends shall be made around a pin of 8 bar diameters. Bars shall be bent cold.

2. The Contractor shall fabricate reinforcement bars for structures in accordance with bending diagrams, placing lists, and placing drawings. Said drawings, diagrams, and lists shall be prepared by the Contractor as specified under the Submittals Section.

3. Fabricating Tolerances. Bars used for concrete reinforcement shall meet the following requirements for fabricating tolerances:

a)	Sheared length:	± 1-inch
b)	Depth of truss bars:	+ 0, -1/2-inch
c)	Stirrups, ties, and spirals:	± ½-inch
d)	All other bends:	± 1-inch

3.03 PLACEMENT

1. Reinforcement shall be accurately positioned on supports, spacers, hangers, or other reinforcement, and shall be secured in place with wire ties or suitable clips. Before concrete is placed, reinforcement shall be rigidly secured in proper position. All surfaces encrusted with dried concrete from previous placements shall be cleaned and the entire installation shall be acceptable to Engineer. Remove all frost, ice, and snow before concrete is placed

2. Reinforcing shall be accurately positioned around pipe opening to conform to the required tolerances. Placement of reinforcing mats without required

pipe openings followed by field cutting of mat to clear pipe flange shall not be permitted.

3. Limitations on the use of bar support materials shall be as follows:

   a) Concrete Dobies: permitted at all locations except where architectural finish is required

   b) Wire Bar Supports: permitted only at slabs over dry areas, interior dry wall surfaces, and exterior wall surfaces.

   c) Plastic Bar Supports: permitted at all locations except on grade.

4. Tie wires shall be bent away from the forms in order to provide the specified concrete coverage.

5. Bars additional to those shown which may be found necessary or desirable by the Contractor for the purpose of securing reinforcement in position shall be provided by the Contractor at his own expense.

6. Unless otherwise specified, reinforcement placing tolerances shall be within the limits specified in ACI 318 except where in conflict with the requirements of the Building Code.

7. Bars may be moved as necessary to avoid interference with other reinforcement steel, conduits, or embedded items. If bars are moved more than one bar diameter, or enough to exceed the above tolerances, the resulting arrangement of bars shall be as acceptable to the Engineer.

8. Welded wire fabric reinforcement placed over horizontal forms shall be supported on slab bolsters. Slab bolsters shall be spaced not more than 30 inches on centers, shall extend continuously across the entire width of the reinforcement mat, and shall support the reinforcement mat in the plane shown.

9. Welded wire fabric placed over the ground shall be supported on wired concrete blocks (dobies) spaced not more than 3 feet on centers in any direction. The construction practice of placing welded wire fabric on the ground and hooking into place in the freshly placed concrete shall not be used.

10. Accessories supporting reinforcing bars shall be spaced such that there is no deflection of the accessory form the weight of the supported bars. When used to space the reinforcing bars from wall forms, the forms and bars shall be located so that there is no deflection of the accessory when the forms are tightened into position.

3.04 SPACING OF BARS

1. The clear distance between parallel bars shall be not less than the nominal diameter of the bars nor less than 1-1/3 times the maximum size of the coarse aggregate, nor less than one inch.

2. The clear distance between bars shall also apply to the distance between a contact splice and adjacent splices or bars.

3.05 SPLICES

A. General:

1. Reinforcement bar splices shall only be used at locations shown. When it is necessary to splice reinforcement at points other than where shown, the character of the splice shall be as acceptable to the Engineer.

2. Unless otherwise indicated, dowels shall match the size and spacing of the spliced bar.

3. Maintain adequate ventilation when using cutting torches.

4. Locate building demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.

B. Site Access and Temporary Controls: Conduct building demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

1. Do not close or obstruct streets, walks, walkways, or other adjacent occupied or used facilities without permission from City and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic-ways if required by authorities having jurisdiction.

2. Use water and other suitable methods to limit spread of dust and dirt. Comply with governing environmental-protection regulations. Do not use water when it may damage adjacent construction or create hazardous or objectionable conditions, such as ice, flooding, and pollution.

C. Explosives: Use of explosives is not permitted.

3.06 DEMOLITION BY MECHANICAL MEANS

A. Salvage: Items to be removed and salvaged are indicated on Drawings.

B. Below-Grade Construction: Demolish foundation walls and other below-grade construction.

1. Remove below-grade construction, including basements, foundation walls, and footings, completely.

C. Existing Utilities: Demolish and remove existing utilities and below-grade utility structures per demolition drawings.

3.07 SITE RESTORATION

A. Below-Grade Areas: Rough grade below-grade areas ready for further excavation or new construction.

B. Site Grading: Uniformly rough grade area of demolished construction to a smooth surface, free from irregular surface changes. Provide a smooth transition between adjacent existing grades and new grades.

3.08 REPAIRS

A. Promptly notify City of damage to adjacent buildings.

3.09 DISPOSAL OF DEMOLISHED MATERIALS

A. Abate, remove, and dispose of all hazardous materials in accordance with applicable State and Federal Regulations.

B. Remove demolition waste materials from Project site and dispose of them in an EPA-approved construction and demolition waste landfill acceptable to authorities having jurisdiction and recycle or dispose of them according to Specification Section 01085, "Construction Waste Management and Disposal."

1. Do not allow demolished materials to accumulate on-site.

2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

C. Remove and dispose of all debris and trash from the property leaving the site in a clean and neat appearance.

D. Do not burn demolished materials.

3.10 CLEANING

A. Clean adjacent structures and improvements of dust, dirt, and debris caused by building demolition operations. Return adjacent areas to condition existing before building demolition operations began.

1. Clean roadways of debris caused by debris transport.

END OF SECTION

SECTION 03250
CONCRETE JOINTS AND ACCESSORIES

PART 1 GENERAL

1.01 SCOPE

A. This section covers concrete accessories including construction, contraction and expansion joints for cast-in-place concrete.

1.02 GENERAL

A. All accessories shall be accurately placed and all joints shall be accurately and properly constructed so cast-in-place concrete can be placed as specified and as indicated on the drawings.

1.03 DRAWINGS AND DATA

A. All submittals of manufacturers' certificates of compliance, test data, reports, catalog data sheets and other data shall be in accordance with the Submittals section.

PART 2 PART 2 - PRODUCTS

2.01 MATERIALS

Expansion joint materials:

Filler	Preformed sponge rubber, ASTM D1752, Type I.
Filler adhesive	As recommended by manufacturer.
Sealant	As specified in the caulking section.
Polyethylene film	NBS Product Standard PS17 or ASTM D4397, 6 mils or thicker.
Epoxy bonding agent	As specified in Concrete Placing, Finishing and Curing section.
Wedge inserts	Malleable iron, with galvanized askew-head bolts, nuts, and washers; Hohmann and Barnard "HW", Richmond "Peerless", or Weston "WC50".

PART 3 PART 3 – EXECUTION

3.01 CONSTRUCTION JOINTS

A. Construction joints shall be made at locations indicated on the drawings or where specified. Construction joints shall not be made at other locations without the concurrence of Engineer.

1. Location. Construction joints shall be located as follows:
   a. In Bottom Slab. Each bottom slab shall be divided into

approximately square sections not to exceed 60 feet in their longest dimension.

Construction shall be perpendicular to the planes of their surfaces.

3.02 EXPANSION AND CONTRACTION JOINTS

A. Expansion joint filler shall be firmly bonded to the previously poured joint face with a suitable adhesive, and the new concrete shall be poured directly against the joint filler. Accessible edges of each expansion and contraction joint shall be sealed as specified in the caulking section.

3.03 PLACEMENT

A. The limits of each concrete pour shall be determined by CONTRACTOR and shall be acceptable to Engineer.

3.04 EMBEDMENTS

A. Anchor bolts, castings, steel shapes, conduits, sleeves, masonry anchors, and other objects that are to be embedded in the concrete shall be accurately positioned in the forms and securely anchored.

Unless installed in pipe sleeves, anchor bolts shall have sufficient threads to permit a nut to be placed on the concrete side of the form or template. A second nut shall be placed on the other side of the form or template, and the two nuts shall be so adjusted that the bolt will be held rigidly in proper position.

3.05 DUCT BANK JOINTS

A. Hardened surfaces that are to receive additional concrete shall be prepared by removing all loose particles, scum, and laitance so that the aggregate is exposed. The hardened surface shall then be thoroughly wetted and a thin coating of neat cement mortar shall be spread over the entire surface just before the fresh concrete is placed. The fresh concrete shall be puddled and spaded to eliminate any honeycomb or lack of mortar near the joint.

3.06 PLACEMENT AGAINST SUBGRADE

A. Where concrete is placed against rock, all loose pieces of rock shall be removed and the exposed surface cleaned with a high-pressure water spray.

3.07 POLYETHYLENE FILM

A. Where concrete is placed against gravel or crushed rock which does not contain at least 25 percent material passing a No. 4 sieve, such surfaces

shall be covered with polyethylene film to protect the concrete from loss of water. Joints in the film shall be lapped at least 4 inches and taped.

END OF SECTION

SECTION 03300
CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.01 SCOPE

A. This section covers procurement of all cast-in-place concrete, including concrete materials, limiting requirements, mixture design, and performance requirements, and delivery to the site through discharge at the end of the delivery truck chute. Work beyond the end of the delivery truck chute is covered in Sections 03100, 03200, 03250, and 03350.

B. Both inch-pound (English) and SI (metric) units of measurement are specified herein; the values expressed in inch-pound units shall govern.

C. Special Inspection shall be provided by the Contractor as indicated on the drawings.

1.02 GENERAL

A. All cast-in-place concrete shall conform to the limiting requirements of this specification including Tables 1A, 1B, 2A and 2B.

1. Concrete Classifications. Concrete classifications shall be defined and used as indicated for the following classes:

Concrete Classifications

Class	Class Description
A.	Structural Concrete
A1.	Concrete for Liquid Containing Structures. Not used.
A2.	Small Aggregate Concrete; Congested Areas. Structural small aggregate concrete shall be used in all areas where the clear distance between reinforcement, conduit, or embedded items is less than the least dimension of coarse aggregate particles in the structural concrete.
A3.	Concrete for Non-Liquid Containing Structures. Concrete for footings, foundations, manholes, catch basins, pan-formed joists, and all other structural concrete other than for liquid containing structures.

Class Class Description

A4. Mortar Puddle. Placed in a lift 2 inches or more deep at the bottom of forms for walls and columns immediately before structural concrete is placed. Not used.

A5. Drilled Pier Concrete. Not used.

B. Exterior Flatwork Concrete. Concrete for exterior slabs on grade, plant pavement, sidewalks, curbs and gutters, and small equipment pads.

C. Architectural Concrete. Not Used.

D. Miscellaneous Concrete

D1. Ductbanks, Pipe Blocking, Concrete Fill, and Pipe Encasement Concrete. Concrete used in ductbanks, pipe blocking, concrete fill and pipe encasements.

D2. Underwater Concrete. Not Used.

D3. Massive Concrete. Not Used.

D4. Pan Stairs Concrete. Not Used.

D5. Wash Water Trough Concrete. Not Used.

D6. Composite Topping Concrete. Not Used.

D7. Lean Concrete. Used as a fill material for over-excavations.

1.03 SUBMITTALS.

1. Drawings and Data. All submittals of drawings; manufacturers' certificates of compliance, recommendations, and test data; reports; catalog data sheets; and other data shall be in accordance with the Submittals section, unless otherwise specified herein.

   Reports and certifications on proposed materials and mixture proportions for each concrete mixture design shall be submitted for review within 30 days after the preconstruction conference and prior to conducting the laboratory trial batches for each mixture design.

2. Manufacturer's Certificate of Compliance. A manufacturer's certificate of compliance, which includes the name of the project and copies of independent test results confirming compliance with specified requirements, shall be submitted to the Engineer for the following materials when used:

Cement.

Admixtures.

Fly Ash.

Slag Cement.

1.04 STORAGE AND HANDLING.

A. Cement, slag cement and fly ash shall be stored in suitable moistureproof enclosures. Cement, slag cement and fly ash which have become caked or lumpy shall not be used.

B. Aggregates shall be stored so that segregation and the inclusion of foreign materials are prevented. The bottom 6 inches [150 mm] of aggregate piles in contact with the ground shall not be used.

1.05 REFERENCE STANDARDS.

A. The publications listed below form part of this specification to the extent referenced and are referred to in the text by the basic designation only. Reference shall be made to the latest edition of said standards unless otherwise called for.

ASTM A 185	Specification for Steel Welded Wire Reinforcement, Plain, for Concrete
ASTM A 615/A 615M	Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
ASTM C 150	Specification for Portland Cement
ASTM C 494	Specification for Chemical Admixtures for Concrete
ASTM C 881	Specification for Epoxy-Resin-Base Bonding Systems for Concrete
CRSI	Recommended Practice for Placing Reinforcing Bars
SSPWC	Standard Specifications for Public Works Construction "Greenbook"

1.06 RELATED WORK SPECIFIED ELSEWHERE

A. WAS Standard Drawings

1. WAS Standard Specifications
03461, 03462, 15000, 15041, 15044, 15056, 15057, 15061, 15064, 15074, 15102, 15108, and 15300.

1.07 APPLICATIONS.

A. The following materials, referenced in other sections, shall be provided and installed in accordance with this specification for the applications noted below:

B. Concrete for thrust and anchor blocks for horizontal and vertical bends, ductile-iron or steel fittings, fire hydrant bury ells, support blocks for valves 100mm (4") and larger, collars, cradles, curbs, encasements, gutters, manhole bases, protection posts, sidewalks, splash pads, and other miscellaneous cast-in-place items, all in accordance with the Standard Drawings.

C. Hand-mixed concrete is permitted when the volume of concrete required is less than 0.76 cubic meters (1.00 cubic yards).

D. Mortar for filling and finishing the joints between manhole and vault sections and setting manhole grade rings and cover frames shall be used. Mortar may also be used for repairs of minor surface defects of no more than 6.35mm (¼") in depth or 12.7mm (½") in width on nonstructural, cast-in-place items such as splash pads or concrete rings around manholes.

E. (Note for large voids, structural concrete and pipe penetrations into vaults shall be repaired with non-shrink grout; repairs to precast manholes and vaults and cast-in-place manhole bases shall be repaired with an epoxy bonding agent and repair mortar, as outlined below.)

F. An epoxy bonding agent for bonding repair mortar to concrete shall be used for repairs to damaged surfaces of precast or cast-in-place concrete manholes and vaults.

G. A non-shrink grout for general-purpose repair of large construction voids, pipe penetrations into vaults and grouting of base plates for equipment or structural members shall be used.

H. Epoxy adhesives for grouting of anchor bolts shall be used.

I. Damp-proofing shall be used for application to the exterior surfaces of concrete manholes and vaults located at or below the water table or where showing evidence of moisture or seepage, and as directed by the Engineer.

PART 2 PRODUCTS

2.01 LIMITING REQUIREMENTS.

A. Unless otherwise specified, each concrete mixture shall be designed and controlled, within the following limits, to provide a dense, durable concrete suitable for the expected service conditions.

B. Concrete materials shall be selected and concrete shall be proportioned, batched, mixed, and delivered in a manner that will minimize shrinkage and cracking as specified herein, and in accordance with Chapters 3 and 8 of ACI 224R. Concrete temperatures shall be controlled before and until delivery at the end of the delivery truck chute to minimize cracking. Any rise in concrete temperature caused by environmental conditions that will be conducive to excessive shrinkage shall be controlled.

C. For each class of concrete, each concrete mixture shall be designed and concrete shall be controlled within the limits in the specification and in Tables 1A and 1B.

1. Cementitious Material Content Limits. The minimum quantity of Portland cement in the concrete shall be as indicated in Tables 1A and 1B.

   Contractor may substitute fly ash for Portland cement within the percentage ranges indicated in Tables 1A and 1B, on the basis of 1.0 lbs [1.0kg] of fly ash added for each lb [kilogram] of Portland cement reduction.

   Contractor may substitute slag cement for Portland cement within the percentage ranges indicted in Tables 1A and 1B on the basis of 1.0 lbs [1.0 kg] of slag cement added for each lb [kilogram] of Portland cement reduction.

   Mixtures using slag cement in combination with fly ash will not be acceptable.

   Maximum cementitious material content, when ASTM C150 Type I Portland cement is used, shall not be more than 1.15 times the minimum Portland cement content specified. When a Type II, Type I/II, or Type V Portland cement is used, the cementitious material content shall not be increased more than necessary to achieve the required f'_{cr}.

2. Maximum Water-Cementitious Material Ratio. The maximum water-cementitious ratio shall be on a cement mass basis, or, if fly ash or slag cement is used, the combined mass of cement plus fly ash or slag cement shall be used to determine the water-

cementitious materials ratio. Limiting maximum water-cementitious material ratios are indicated in Tables 1A and 1B.

3. Aggregates. Aggregates shall comply with ASTM C33 except as specified herein. Fine aggregate shall be clean natural sand. Artificial or manufactured sand will not be acceptable. Coarse aggregate shall be crushed rock, washed gravel, or other inert granular material, meeting Class 4S requirements, except that clay and shale particles shall not exceed values indicated in Tables 1A and 1B.

   When ASTM C33 gradations are specified, final gradation of the coarse aggregate shall conform to maximum nominal size grading requirements of ASTM C33, when one size of aggregate or a combination of two or more sizes is used.

   When the 18-8 combined aggregate gradation is required, the combined aggregates shall be well graded from the coarsest to the finest. Not more than 18 percent nor less than 8 percent (18-8 requirement) of the combined aggregate shall be retained on any individual sieve with the exceptions that the No. 50 [300 µm] may have less than 8 percent retained, sieves finer than No. 50 [300 µm] shall have less than 8 percent retained, and the coarsest sieve may have less than 8 percent retained.

   Aggregates used in concrete shall have a combined aggregate distribution similar to the aggregates used in the concrete trial mixtures. Reports of individual aggregates shall include sieve sizes 1-1/2 inch, 1 inch, 3/4 inch, 1/2 inch, 3/8 inch, No. 4, No. 8, No. 16, No. 30, and No. 50 [38 mm, 25 mm, 19 mm, 12.5 mm, 9.5 mm, 4.75 mm, 2.36 mm, 1.118 mm, 600 µm, and 300 µm] in accordance with ASTM E11.

   When available aggregates are elongated or slivered and cause interference with mixture mobility, or available aggregate gradations will not comply with the 18-8 requirement and when permitted by Engineer, the combined aggregate percentages may be changed to not more than 22 percent nor less than 6 percent retained on any individual sieve.

   Specified sand equivalent for fine aggregate shall be not less than indicated in Tables 1A and 1B for an average of 3 samples tested in accordance with ASTM D2419.

   The maximum coarse aggregate content consistent with workability and minimizing shrinkage shall be used in the mixture. To comply with the specified concrete shrinkage test requirements, the clay and shale content of the aggregates may need to be reduced by washing the aggregate.

4. Ratio of Fine to Total Aggregates. The ratio of fine to total aggregates, based on solid volumes (not weights), shall be as follows:

Coarse Aggregate Size	Minimum Ratio	Maximum Ratio
3/8 inch [9.5 mm]	0.45	0.60
1/2 inch [12.5 mm]	0.40	0.55
3/4 inch [19 mm]	0.35	0.50
1 inch [25 mm]	0.30	0.46
1-1/2 inch [37.5 mm]	0.25	0.40

5. Slump. Concrete slump shall be kept as low as possible, consistent with proper handling and thorough consolidation. Slump shall be at least 2 inches [50 mm] and shall not exceed the maximum slump as indicated in Tables 1A and 1B.

   When superplasticizer is dispensed at the ready-mix plant, the concrete mixture design shall be based on a maximum slump as indicated in Tables 1A and 1B; and when superplasticizer is dispensed at the site, slump shall not exceed the maximum slump as indicated in Tables 1A and 1B before superplasticizer is added.

6. Initial Set. The initial set, as determined by ASTM C403, shall be attained 5-1/2 hours ±1 hour after the water and cement are added to the aggregates for each concrete mixture. The quantity of retarding admixture shall be adjusted to compensate for variations in temperature and job conditions.

7. Total Air Content. The total volumetric air content of concrete after placement shall be as indicated in Tables 1A and 1B, and within ±1 percent. Air-entraining admixture may be omitted from concrete for interior slabs which are to be trowel finished, and from Classes D1, D2, and D7 concrete.

8. Admixtures. Only approved or specified admixtures shall be used.

   Unless otherwise acceptable to the Engineer, all admixtures shall be from one manufacturer and shall be compatible. Admixtures that are compatible with other admixtures and concrete materials shall not have an adverse affect on the required properties of the concrete nor the specified limiting requirements. The admixture content, batching method, and time of introduction to the mixture

shall comply with these specifications and with the manufacturer's recommendations for minimum shrinkage. The admixture manufacturer shall provide qualified field services as necessary, at no additional cost to Owner.

Admixtures used in the concrete shall be as recommended in writing by the admixture manufacturer prior to conducting the laboratory trial concrete mixture testing and the shrinkage test. No calcium chloride nor admixture containing chloride from sources other than residual impurities in admixture ingredients will be permitted. Admixtures containing unrefined or raw lignosulfonic acids ("lignins") or their salts will not be acceptable.

Combination of admixtures which cause premature or local dehydration or post-compaction settlement of the concrete surface shall not be used. If any such undesirable characteristics are observed, the use of the mixture shall be discontinued and an alternate mixture design used.

A water-reducing admixture shall be included in all concrete, except Classes D1 and D7 concrete. Unless otherwise required, a mid-range plasticizing admixture or a superplasticizer may be used, at the option of Contractor, in all other concrete except Classes D1 and D7. When a mid-range plasticizing admixture is used as a superplasticizer or when a superplasticizer is used, the admixture manufacturer shall recommend to Engineer, in writing, the type of superplasticizer to be used with the required water-reducing admixture to achieve the specified initial-set times.

Superplasticizer may be dispensed into the concrete at the plant or on the job site and shall be mixed in accordance with the admixture manufacturer's recommendations. Each superplasticizer dose, when dispensed at the site, shall be easily verifiable and recorded on the delivery ticket. The superplasticizer for each load shall be accurately proportioned into a separate container prior to dispensing the admixture into the concrete. When truck-mounted dispensers are used, the system shall not be flushed or cleaned with water until after the entire load of concrete has been discharged. When permitted by Engineer, redosing of concrete with superplasticizer shall be done only once. Redosing procedures shall be as recommended by the admixture manufacturer.

A shrinkage reducing admixture may be added to concrete class A1. If used, it shall replace an equal volume of mixing water or as otherwise recommended by the admixture manufacturer. The quantity of air entrainment admixture shall be adjusted as required by the admixture manufacturer to keep mix air content within specified limits.

9. Strength. In addition to the other limiting requirements to achieve durability and minimize shrinkage, the minimum acceptable compressive strengths of concrete tested at the end of the delivery truck chute using 6 by 12 inch [150 by 300 mm] site-cast cylinders, as determined by ASTM C39, shall be as indicated in Tables 1A and 1B.

   Adequate test cylinders taken at the point of placement shall also be made to verify that the construction contractor's concreting procedures comply with applicable industry standard procedures.

10. Pumped Concrete. Coarse aggregate size for pumped concrete mixtures shall be limited to a maximum of 1 inch [25.4 mm].

    The slump of concrete, with or without a superplasticizer,that is discharged into the pump may exceed the specified maximum slump value by the amount of slump loss in the pumping system, up to a maximum of 1 inch [25 mm]. The slump loss shall be determined by tests made at each end of the pumping system.

11. Water-Soluble Chloride. Maximum water-soluble chloride ion concentrations in hardened concrete at an age of 28 days shall not exceed the limits expressed as a percentage of mass of cement as indicated in Tables 1A and 1B.

    Test results shall be reported as the percentage of water-soluble chloride ions in the concrete and as a percentage of chloride ion relative to the mass of cement in the concrete.

    Testing of the concrete components, except aggregates, for water-soluble chloride ions will be done at the discretion of Contractor. Copies of the reports on such tests shall be furnished to Engineer.

    The hardened concrete and each gradation of aggregate used in the concrete shall be tested each time a chloride ion test is conducted on a concrete mixture.

12. Laboratory Shrinkage Limits. Based on the modified ASTM C157 test procedures as specified herein, the shrinkage limits of concrete shall be the average drying shrinkage of each set of three test specimens cast in the laboratory from a trial batch as measured at the 21 days drying age, and shall not exceed the values in Tables 1A and 1B.

    The average drying shrinkage of each set of test specimens cast in the field from concrete delivered to the site, and sampled at the end of the delivery truck chute, as measured at the 21 days drying age shall not exceed the values in Tables 1A and 1B.

13. Cold Weather Concrete. Except as modified herein, cold weather concrete shall comply with ACI 306R. The temperature of concrete at the point of delivery at the end of the delivery truck chute shall be not less than that indicated in ACI 306R for corresponding outdoor temperature (in shade) at the time of placement:

    When delivered, heated concrete shall be not warmer than 80°F [26°C].

14. Hot Weather Concrete. Except as modified herein, hot weather concrete shall comply with ACI 305R. At air temperatures of 90°F [32°C] or above, concrete shall be kept as cool as possible before and during delivery. The temperature of the concrete at the time of delivery at the end of the delivery truck chute shall not exceed the values indicated in Tables 1A and 1B.

2.02 MATERIALS.

Cement	ASTM C 150, Type II/V.Low Alkali.
Fly Ash	ASTM C618, Class F or ASTM C618, Class C that passes ASTM C1012 testing for moderate sulfate resistance, except loss on ignition shall not exceed 4 percent.
Slag Cement (GGBFS)	ASTM C989, Grade 100 or Grade 120.
Aggregates, Fine and Coarse	As specified in Limiting Requirements paragraph.
Water	Potable.
Admixtures	
Water Reducing/Normal Set	ASTM C494, Type A, except as otherwise specified herein.
Water Reducing/Retarding	ASTM C494, Type D, except as otherwise specified herein.
Air-Entraining	ASTM C260.
Superplasticizing/Normal Set	ASTM C494, Type F, extended slump life type, except as otherwise specified herein.

Superplasticizing/Retarding	ASTM C494, Type G, extended slump life type, except as otherwise specified herein.
Shrinkage Reducing Admixture	Grace "Eclipse Plus" or BASF (Master Builders) "Tetraguard AS20".

2.03 PROPORTIONING.

1. Mixture Design. Using concrete materials acceptable to Engineer, a tentative concrete mixture shall be designed and tested in the laboratory for each size and combined gradation of aggregates and for each consistency as indicated and intended for use on the work and as specified.

   Concrete proportions shall be established based on laboratory trial mixtures that meet the following requirements:

a. The combination of materials shall be as proposed for use in the work.

b. Mixtures shall conform with the limiting requirements specified herein.

c. The required average compressive strength, f'_{cr}, of the trial mixture, using 6 x 12 [150 x 300] cylinders, shall exceed the specified minimum acceptable compressive strength, f'_{cr}, as required in Tables 1A and 1B.

d. Trial mixtures of the proportions and consistencies specified for the work shall be prepared. When a three point curve is required by Tables 2A and 2B, the three concrete trial mixtures shall reflect the cement content proposed for the project and for the indicated concrete class at three water-cementitious material ratio contents at or lower than indicated in Tables 1A and 1B. The compressive strength of the cylinders made from the three trial mixtures shall produce a range of compressive strengths exceeding or encompassing the f'_{cr} required for the work.

e. For each proposed concrete mixture that is required to be tested as indicated in Tables 2A and 2B, at least three 6 by 12 inch [150 by 300 mm] compressive strength test cylinders shall be made for each age. Each change in the water-cementitious materials ratio shall be considered a new concrete mixture. Each mixture shall be tested at the ages of 7 days and 28 days with two test cylinders broken at 28 days.

f. When a three point curve is required in Table 2A or 2B, the results of the cylinder tests for each water-cementitious materials ratio at each age shall be plotted as a curve showing the relationship between compressive strength (along y-axis) and the water-cementitious materials ratio (along x-axis). The water-cementitious materials ratio for the concrete mixture to be used in the work shall be selected from the 28 day curve to produce the required average compressive strength. The cement content and mixture proportions to be used shall be such that the selected water-cementitious materials ratio will not be exceeded at specified maximum slump. These concrete mixture proportions shall be submitted for review in accordance with the submittals section.

g. When a shrinkage reducing admixture is proposed, trial batches shall be prepared with and without the shrinkage reducing admixture.

If acceptable in Table 2A or 2B, concrete mixtures may utilize prior field test data in lieu of laboratory trial mixtures. Field test data records shall be from the production facility being used on current project and shall have been performed in the past 12 months. Field test data records shall represent a single group of at least 10 consecutive strength tests for one mixture, using the same materials, under the same conditions, and encompassing a period of not less than 60 days.

Mixtures shall be adjusted in the field as necessary, within the limits specified, to meet the requirements of these specifications.

2. Preliminary Review. Reports covering the source and quality of concrete materials and the concrete proportions proposed for the work shall be submitted to Engineer for review before performing the required trial mixture designs and before concrete work is started. The reports required shall be as indicated in Tables 2A and 2B. Review of these reports will be for general acceptability only, and continued compliance with all contract provisions will be required.

3. Aggregate Reports. Reports on aggregates shall include the information listed in Tables 2A and 2B. Aggregate reports shall be project specific and shall be no more than 90 days old at time of submittal.

4. Mixture Design Report. Design quantities and test results on each mixture shall be submitted for review and shall be accepted before concrete work is started. The report on each tentative concrete mixture and on the proposed concrete mixture shall contain the information in Tables 2A and 2B, and shall be submitted to Engineer.

5. Mixture Design Testing. As stipulated in the Quality Control section, all tests and reports required for preliminary review shall both be made by an independent testing laboratory at the expense of Owner specifically for this project. All materials shall be tested in accordance with the specified test methods and reports for these tests shall be prepared specifically for this project. If the source of any concrete materials is changed during the contract, the materials and the new mixture design shall be tested in accordance with the specified preliminary review requirements and reports shall be submitted for review.

   Aggregates shall be sampled and tested in accordance with ASTM C33. In addition, the bulk specific gravity of each aggregate shall be determined in accordance with ASTM C127 and ASTM C128.

   Concrete test specimens shall be made, cured, and stored in accordance with ASTM C192 and tested in accordance with ASTM C39.

   Slump shall be determined in accordance with ASTM C143. Total air content shall be determined in accordance with ASTM C231 and verified in accordance with ASTM C138. Concrete temperature shall be determined in accordance with ASTM C1064 and unit weight (mass) shall be determined in accordance with ASTM C138. Water-soluble chloride ion shall be determined in accordance with ASTM C1218.

   Initial set tests shall be made at ambient temperatures of 70°F and 90°F [21°C and 32°C] to determine compliance with the specified time for initial set. The test at 70°F [21°C] shall be made using concrete containing the specified normal set/water-reducing admixture and, when required, air-entraining admixture. The test at 90°F [32°C] shall be made using concrete containing the specified retarding/water-reducing admixture and, when required, air-entraining admixture. Initial set shall be determined in accordance with ASTM C403.

   A preliminary test on a trial batch shall be conducted at the project site, using the proposed superplasticizer in the accepted mixture design to determine the correct dosage. When superplasticizer is not included in the trial mixture, the trial batch tested at the site shall be used to determine compatibility of the superplasticizer with the other materials used in the concrete, including the other admixtures.

   A drying shrinkage test shall be conducted on the preliminary trial batch with the maximum water-cementitious materials ratio used to qualify each proposed concrete mixture design using the concrete

materials, including admixtures,that are proposed for the project. Three test specimens shall be prepared for each test. Drying shrinkage specimens shall be 4 inch by 4 inch by 11 inch [100 by 100 by 275 mm] prisms with an effective gauge length of 10 inches [250 mm], fabricated, cured, dried, and measured in accordance with ASTM C157 except with the following modifications:

Specimens shall be removed from the molds at an age of 23 hours ±1 hour after trial batching, shall be placed immediately in water at 73°F ±3°F [23°C ±2°C] for at least 30 minutes, and shall be measured within 30 minutes thereafter to determine original length and then submerged in lime-saturated water as specified in ASTM C157. Measurement to determine expansion expressed as a percentage of original length shall be taken at age 7 days. The length at 7 days shall be the base length for drying shrinkage calculations ("0" days drying age). Specimens then shall be stored immediately in a humidity controlled room maintained at 73°F ±3°F [23°C ±2°C] and 50 percent ±4 percent relative humidity for the remainder of the test. Measurements to determine shrinkage expressed as a percentage of the base length shall be reported separately for 7, 14, and 21 days ±4 hours of drying from "0" days after 7 days of moist curing for a total of 28 days from the date of casting.

Drying shrinkage deformation for each specimen shall be computed as the difference between the base length (at "0" days drying age) and the length after drying at each test age. Results of the shrinkage test shall be reported to the nearest 0.001 percent. If drying shrinkage of any specimen deviates from the average for that test age by more than 0.004 percent, the results for that specimen shall be disregarded.

The average drying shrinkage of each set of 4 inch by 4 inch by 11 inch [100 by 100 by 275 mm] test specimens made in the laboratory from a trial batch shall not exceed the values required in Tables 1A and 1B. Drying shrinkage tests will only be required for concrete mixtures indicated in Tables 1A, 1B, 2A, and 2B.

Alkali-aggregate reactivity potential shall be determined in accordance with Appendix XI of ASTM C33. Aggregates shall be tested in accordance with ASTM C289 and C295 or ASTM C1260 to determine potential reactivity. Aggregates which do not indicate a potential for alkali reactivity or do not have reactive constituents may be used without further testing. Aggregates which indicate a potential for alkali reactivity shall be further tested in accordance with ASTM C227 or C1105, as appropriate, using a cement containing less than 0.6 percent alkalies. At the discretion of Engineer, testing in addition to that indicated in Appendix XI of ASTM C33 may be performed on potentially reactive aggregates. Nonreactive aggregates shall be imported if, in the opinion of the Engineer, local aggregates exhibit unacceptable potential reactivity.

2.04 BATCHING AND MIXING.

A. Concrete shall conform to ASTM C94 and shall be furnished by an acceptable ready mixed concrete supplier.

1. Consistency. The consistency of concrete shall be suitable for the placement conditions. Aggregates shall float uniformly throughout the mass, and the concrete shall flow sluggishly when vibrated or spaded. The slump shall be kept uniform.

2. Delivery Tickets. A delivery ticket shall be prepared for each load of ready-mixed concrete and a copy of the ticket shall be handed to Engineer by the truck operator at the time of delivery. Tickets shall indicate the name and location of Contractor, the project name, the mixture identification, the quantity of concrete delivered, the quantity of each material in the batch, the outdoor temperature in the shade, the time at which the cement was added, and the numerical sequence of the delivery.

PART 3 EXECUTION

3.01 CONTRACTOR'S ON GOING MATERIAL CONTROL TESTING.

A. The following tests and the test reports are required during the progress of the work and shall be made at the expense of Owner. The frequency specified herein for each field control test is approximate and subject to change as determined by Engineer.

1. Aggregate Gradation. Each 200 tons [180 Mg] of fine aggregate and each 400 tons [360 Mg] of coarse aggregate shall be sampled and tested in accordance with ASTM D75 and C136. If lesser quantities of aggregates are used the sampling and testing shall occur at least once every 6 months.

2. Sand Equivalent. The sand equivalent test shall be conducted each time the sand gradation tests are conducted.

3. Fly Ash. Each 400 tons [360 Mg] of fly ash shall be sampled and tested in accordance with ASTM C618 and C311. Contractor shall supply Engineer with certified copies of supplier's (source) test reports showing chemical composition and physical analysis for each shipment delivered to Contractor and certifying that the fly ash complies with the specifications. The certificate shall be signed by both the fly ash supplier and Contractor.

4. Cement. Contractor shall supply Engineer with certified copies of supplier's (source) test reports showing chemical composition and physical analysis for each shipment delivered to Contractor, and certifying that the cement complies with ASTM C150 and these

specifications. The certificate shall be signed by both the cement manufacturer and Contractor.

3.02 OWNER'S FIELD CONTROL TESTING.

A. Field control tests, including aggregate gradation (if needed), slump, air content, and making compression test cylinders, shall be performed by Engineer or testing laboratory personnel. Contractor shall provide all facilities and the services of one or more employees as necessary to assist with the field control testing.

B. As stipulated in the quality control section, tests required during the progress of the work shall be made at the expense of Owner.

C. The frequency specified herein for each field control test is approximate and subject to change as determined by Engineer.

D. Engineer may require field testing prior to the addition of superplasticizer at the site to determine compliance with the specifications. Field testing after the addition of superplasticizer shall be conducted as specified and as needed to determine that the concrete is in compliance with the specifications. Air tests shall be conducted whenever field tests are conducted.

1. Slump. A slump test shall be made for each 50 cubic yards [40 m^3] of concrete. Slump shall be determined in accordance with ASTM C143.

2. Air Content. An air content test shall be made on concrete from one of the first three batches mixed each day and on concrete from each batch of concrete from which concrete compression test cylinders are made. Air content shall be determined in accordance with ASTM C231 and verified in accordance with ASTM C138.

3. Unit Weight. A unit weight test shall be made on concrete from each batch of concrete from which concrete compression test cylinders are made. Unit weight shall be determined in accordance with ASTM C138.

4. Concrete Temperature. A concrete temperature test shall be made on concrete from the first batch of concrete mixed each day and on concrete from each batch of concrete from which concrete compression test cylinders are made. Concrete temperature shall be determined in accordance with ASTM C1064.

5. Water-Soluble Chloride Ion. Water-soluble chloride ion testing shall be performed once for each 1,000 cubic yards [764 m^3] of concrete in accordance with ASTM C1218.

6. Compression Tests. One set of four concrete compression test cylinders shall be made each day when 25 to 50 cubic yards [15 to 38 m^3] of concrete is placed. One additional set of test cylinders shall be made from each additional 50 cubic yards [38 m^3], or major fraction thereof, placed in any one day. Two cylinders of each set shall be tested at an age of 7 days and the remaining cylinders shall be tested at an age of 28 days.

   Test cylinders shall be 6 inches in diameter by 12 inches high [150 mm in diameter by 300 mm high] and shall be made, cured, stored, and delivered to the laboratory in accordance with ASTM C31 and tested in accordance with ASTM C39.

   Each set of compression test cylinders shall be marked or tagged with the date and time of day the cylinders were made, the location in the work where the concrete represented by the cylinders was placed, the number of the delivery truck or batch, the air content, the slump, the unit weight, and the concrete temperature.

7. Shrinkage Tests. Concrete shrinkage tests shall be performed once for each 1,000 cubic yards [764 m^3] of concrete with controlled shrinkage that is placed and shall be made on concrete from a batch of concrete from which concrete compression test cylinders are made. Shrinkage testing shall be conducted as specified for the preliminary trial mixes.

   The average drying shrinkage of each set of test specimens cast in the field from concrete delivered to the site as measured at the 21 days' drying age shall not exceed the values indicated in Tables 1A and 1B.

8. Test Reports. Five copies of each test report shall be prepared and distributed by the testing laboratory to the Resident Project Representative (two copies), Engineer, and Contractor, in accordance with the Quality Control section.

3.03 EVALUATION AND ACCEPTANCE OF CONCRETE.

A. Concrete will be evaluated for compliance with all requirements of the specifications. Concrete strength will be only one of the criteria used for evaluation and acceptance of the concrete. The results of all tests performed on the concrete and other data and information concerning the procedures for handling, placing, and curing concrete will be used to evaluate the concrete for compliance with the specified requirements.

B. Compression tests will be evaluated in accordance with ACI 318 and as specified herein. A strength test shall be the average of the compressive

strengths of two cylinders made from the same concrete sample tested at 28 days.

1. Compression Test Evaluation. Compressive strength test results will be evaluated for compliance with the specified strength requirements. The strength level of the concrete will be considered satisfactory when the averages of all sets of three consecutive strength tests equal or exceed the specified compressive strength, f'_c, and no individual strength test result falls below the specified compressive strength by more than 500 psi [3.5 MPa].

2. Inspection of Concrete Supplier. Both scheduled and unscheduled visits by inspectors on days of concrete pours shall be accommodated. Inspectors shall be allowed access to mix tickets and mix proportions.

TABLE 1A - LIMITING REQUIREMENTS								
	Concrete Classification	A					B	C
	Concrete Class	A1	A2	A3	A4	A5		
1.	Minimum Cement Content, lbs/cubic yard [kg/m^3]; based on maximum slump and maximum water-cementitious material ratio.							
	Maximum Nominal Aggregate Size, ASTM C33 aggregate							
A	Size No. 467 (1-1/2") [38 mm]	---	---	489 [290]	---	---	464 [275]	---
B	Size No. 57 (1") [25 mm]	---	---	514 [305]	---	---	489 [290]	---
C	Size No. 67 (3/4") [19 mm]	---	---	526 [312]	---	---	514 [305]	---
D	Size No. 7 (1/2") [12.5 mm]	---	601 [357]	555 [329]	---	---	526 [312]	---
E	Size No. 8 (3/8") [9.5 mm]	---	636 [377]	564 [335]	---	---	555 [329]	---
F	Fine Aggregate, (Sand)	---	---	---	---	---	---	---
2.	Compressive Strength, minimum; psi [MPa]							
A	Field, 7 days;	---	3,000 [21]	3,000 [21]	---	---	3,000 [21]	---

TABLE 1A - LIMITING REQUIREMENTS								
	Concrete Classification	A					B	C
	Concrete Class	A1	A2	A3	A4	A5		
B	Field, 28 days; f'_c	---	4,000 [28]	4,000 [28]	---	---	4,000 [28]	---
C	Laboratory, 28 days; f'_{cr}	---	5,200 [36]	5,200 [36]	---	---	5,200 [36]	---
3.	Maximum water-cementitious material ratio	---	0.45	0.45	---	---	0.48	---
4.	Maximum coarse aggregate size.	---	1/2 [13]	1 [38]	---	---	1-1/2 [38]	---
5.	Aggregate gradation requirements							
A	ASTM C33 maximum nominal aggregate size gradation required.	---	Yes	Yes	Yes	Yes	Yes	Yes
B	"18-8" combined gradation required.	---	---	---	---	---	---	---
6.	Maximum slump, inches [mm]							
A	Slump before super-plasticizer added	---	3 [75]	4 [100]	---	---	4 [100]	---
B	Slump after adding superplasticizer	---	8 [200]	8 [200]	---	---	8 [200]	---
7.	Air entrainment, percent, (±1 percent)	---	6	6	---	---	6	---
8.	Fly ash replacement, percent	---	Range 15-25	Range 15-25	---	---	Range 15-25	---
9.	Slag cement replacement, percent	---	Range 25-50	Range 25-50	---	---	Range 25-30	---
10	Testing limits							
A	Sand equivalent, min. percent	---	75	75	---	---	75	---
B	Chloride ion, max. percent	---	0.10	0.15	---	---	0.15	-
C	Shrinkage, max. percent; based 4 x 4 x 11 inch specimen							
	Laboratory	---	0.036	0.048	---	---	0.048	---
	Field	---	0.048	0.064	---	---	0.064	---

TABLE 1A - LIMITING REQUIREMENTS								
	Concrete Classification	A					B	C
	Concrete Class	A1	A2	A3	A4	A5		
D	Coarse Aggregate: Clay and shale combined particles shall not exceed, max. percent	---	1	1	---	---	3	---
11	Concrete Temperature, max. °F [°C]							
A	Temperature at time of delivery, max.	---	85 [29]	90 [32]	---	---	95 [35]	---
B	Temperature at time of placement, max.	---	85 [29]	90 [32]	---	---	95 [35]	---

TABLE 1B - LIMITING REQUIREMENTS								
	Concrete Classification	D						
	Concrete Class	D1	D2	D3	D4	D5	D6	D7
1.	Minimum Cement Content, lbs/cubic yard [kg/m^3]; based on maximum slump and maximum water-cementitious material ratio.							
	Maximum Nominal Aggregate Size, ASTM C33 aggregate							
A	Size No. 467 (1-1/2") [38 mm]	---	---	---	---	---	---	380 [226]
B	Size No. 57 (1") [25 mm]	460 [273]	---	---	---	---	---	400 [237]
C	Size No. 67 (3/4") [19 mm]	480 [285]	---	---	---	---	---	420 [249]
D	Size No. 7 (1/2") [12.5 mm]	500 [297]	---	---	---	---	---	440 [261]
E	Size No. 8 (3/8") [9.5 mm]	520 [308]	---	---	---	---	---	460 [273]
2.	Compressive Strength, minimum; psi [MPa]							
A	Field, 7 days;	2,250 [16]	---	---	---	---	---	1,500 [11]
B	Field, 28 days; f'_c	3,000 [21]	---	---	---	---	---	2,000 [14]

TABLE 1B - LIMITING REQUIREMENTS								
	Concrete Classification	D						
	Concrete Class	D1	D2	D3	D4	D5	D6	D7
C	Laboratory, 28 days; f'_{cr}	3,200 [22]	---	---	---	---	---	2,000 [14]
3.	Maximum water-cementitious material ratio	0.65	---	---	---	---	---	0.75
4.	Maximum coarse aggregate size; inches [mm].	1" [25]	---	---	---	---	---	1" [38]
5.	Aggregate gradation requirements							
A	ASTM C33 maximum nominal aggregate size gradation required.	Yes	Yes	Yes	Yes	Yes	Yes	Yes
B	"18-8" combined aggregate gradation required.	---	---	---	---	---	---	---
6.	Maximum slump, inches [mm]							
A	Slump before superplasticizer added	5 [125]	---	---	---	---	---	6 [150]
B	Slump after adding superplasticizer	8 [200]	---	---	---	---	---	10 [250]
7.	Air entrainment, percent (±1 percent)	---	---	---	---	---	---	---
8.	Fly ash replacement, percent	Range 15-30	---	---	---	---	---	Range 15-30
9.	Slag cement replacements percent	Range 25-50	---	---	---	---	---	Range 25-50
10	Testing limits							
A	Sand equivalent, min.	---	---	---	---	---	---	---
B	Chloride ion, max. percent	0.30	---	---	---	---	---	0.30
C	Shrinkage, max. percent; 4 x 4 x 11 inch specimen							
	Laboratory	---	---	---	---	---	---	---
	Field	---	---	---	---	---	---	---

TABLE 1B - LIMITING REQUIREMENTS								
	Concrete Classification	D						
	Concrete Class	D1	D2	D3	D4	D5	D6	D7
D	Coarse Aggregate: Clay and shale combined particles shall not exceed, max. percent	10	---	---	---	---	---	3
11	Concrete temperature, max °F [°C]							
A	Temperature at time of delivery	95 [35]	---	---	---	---	---	95 [35]
B	Temperature at time of placement	95 [35]	---	---	---	---	---	95 [35]

NOTES:

"D2" (Underwater concrete) - Limit aggregate to 3/4" for reinforced concrete, up to 1-1/2" for unreinforced concrete.

* "D2" (Underwater concrete).- Reduce cement content 100 lbs per cubic yard [59 kg/m^3] for each aggregate size listed for 2,500 psi [17 MPa].

a "D5" Wash water trough top edge water-cementitious ratio, 100 percent sand passing No. 8 [2.36 mm] sieve.

TABLE 2A - SUBMITTAL REQUIREMENTS								
	Concrete Class	A1	A2	A3	A4	A5	B	C
1	Aggregate reports (ASTM C33)							
A	Fine aggregate							
	Source and type	---	X	X	---	---	X	---
	Gradation	---	X	X	---	---	X	---
	Deleterious materials	---	X	X	---	---	X	---
	Fineness modulus	---	X	X	---	---	X	---
	Alkali-aggregate reactivity	---	X	X	---	---	X	---
	Sand equivalent	---	X	X	---	---	X	---
B	Coarse aggregate							
	Source and type	---	X	X	---	---	X	---
	Gradation	---	X	X	---	---	X	---
	Deleterious materials	---	X	X	---	---	X	---
	Abrasion loss	---	X	X	---	---	X	---
	Soundness test	---	X	X	---	---	X	---
	Alkali-aggregate reactivity	---	X	X	---	---	X	---

TABLE 2A - SUBMITTAL REQUIREMENTS								
	Concrete Class	A1	A2	A3	A4	A5	B	C
C	Combined aggregate gradation	---	X	X	---	---	X	---
D	"18-8" requirement	---	---	---	---	---	---	---
2	Cement, mill report	---	X	X	---	---	X	---
3	Cementitious material, type, data sheet, and test report (fly ash, slag cement)	---	X	X	---	---	X	---
4	Admixtures							
A	Data sheets and certifications for each required	---	X	X	---	---	X	---
B	Manufacturer's approval letter required	---	X	X	---	---	X	---
5	Mixture proportions, reports							
A	Mixture proportions report using field test data (prior experience) acceptable	---	---	---	---	---	---	---
B	Job-specific laboratory trial mix required	---	X	X	---	---	X	---
C	Three point curves required	---	X	X	---	---	---	X
D	Compressive strength at 7 and 28 days	---	X	X	---	---	X	---
E	Mixture proportions report	---	X	X	---	---	X	---
	Slump	---	X	X	---	---	X	---
	Water content	---	X	X	---	---	X	---
	Water-cementitious materials ratio	---	X	X	---	---	X	---
	Brand, type, composition, and quantity of cement	---	X	X	---	---	X	---
	Brand, type, composition, and quantity of fly ash	---	X	X	---	---	X	---
	Specific gravity of each aggregate	---	X	X	---	---	X	---
	Ratio of fine to total aggregates	---	X	X	---	---	X	---
	Air content	---	X	X	---	---	X	---
	Temperature	---	X	X	---	---	X	---
	Unit weight	---	X	X	---	---	X	---
	Time of initial set at 70°F and 90°F [21°C and 32°C].	---	X	X	---	---	X	---
6	Water-soluble chloride ion, report	---	X	X	---	---	X	---
7	Shrinkage, report	---	X	X	---	---	X	---
8	Field compression test evaluation reports taken at end of delivery truck chute	---	X	X	---	---	X	---

TABLE 2B - SUBMITTAL REQUIREMENTS								
	Concrete Class	D1	D2	D3	D4	D5	D6	D7
1	Aggregate reports							
A	Fine aggregate							
	Source and type	X	---	---	---	---	---	---
	Gradation	X	---	---	---	---	---	---
	Deleterious materials	X	---	---	---	---	---	---
	Fineness modulus	---	---	---	---	---	---	---
	Alkali-aggregate reactivity	X	---	---	---	---	---	X
	Sand equivalent	---	---	---	---	---	---	---
B	Coarse aggregate							
	Source and type	X	---	---	---	---	---	X
	Gradation	X	---	---	---	---	---	X
	Deleterious materials	X	---	---	---	---	---	---
	Abrasion loss	---	---	---	---	---	---	---
	Soundness test	---	---	---	---	---	---	---
	Alkali-aggregate reactivity	X	---	---	---	---	---	X
C	Combined aggregate gradation	X	---	---	---	---	---	---
	"18-8" requirement	---	---	---	---	---	---	---
2	Cement, mill report	X	---	---	---	---	---	X
3	Cementitious material, type, data sheet, and test report (fly ash, slag cement)	X	---	---	---	---	---	X
4	Admixtures							
A	Data sheets and certifications for each required	X	---	---	---	---	---	X
B	Manufacturer's approval letter required	X	---	---	---	---	---	X
5	Mixture proportions, reports							
A	Mixture proportions report using field test data (prior experience) acceptable	X	---	---	---	---	---	X
B	Job-specific laboratory trial mix required	---	---	---	---	---	---	---
C	Three point curves required	---	---	---	---	---	---	---
D	Compressive strength at 7 and 28 days	X	---	---	---	---	---	X
E	Mixture proportions report	X	---	---	---	---	---	X
	Slump	---	---	---	---	---	---	---

TABLE 2B - SUBMITTAL REQUIREMENTS								
	Concrete Class	D1	D2	D3	D4	D5	D6	D7
	Water content	X	---	---	---	---	---	---
	Water-cementitious materials ratio	X	---	---	---	---	---	---
	Brand, type, composition, and quantity of cement	X	---	---	---	---	---	---
	Brand, type, composition, and quantity of fly ash	X	---	---	---	---	---	X
	Specific gravity of each aggregate	X	---	---	---	---	---	X
	Ratio of fine to total aggregates	---	---	---	---	---	---	---
	Air content	---	---	---	---	---	---	---
	Temperature	X	---	---	---	---	---	X
	Unit weight	---	---	---	---	---	---	---
	Time of initial set at 70°F and 90°F [21°C and 32°C].	X	---	---	---	---	---	X
6	Water-soluble Chloride ion	X	---	---	---	---	---	---
7	Shrinkage	---	---	---	---	---	---	---
8	Field Compression Test Evaluation Reports taken at End of Delivery Truck Chute	---	---	---	---	---	---	---

C. As stipulated in Specification Section 01400, "Quality Requirements", special tests and inspections required during the progress of work will be made at the expense of Contractor.

END OF SECTION

SECTION 03350
CONCRETE PLACING, FINISHING, AND CURING

PART 1 GENERAL

1.01 SCOPE.

A. This section covers placing, finishing, and curing of cast-in-place concrete.

1.02 GENERAL.

A. All cast-in-place concrete shall be accurately formed and properly placed, finished, and cured as indicated on the drawings and as specified herein.

1.03 SUBMITTALS.

1. Drawings and Data. All submittals of test data, manufacturers' certificates of compliance, reports, catalog data sheets and other data shall be in accordance with the Submittals section.

2. Manufacturer's Certificate of Compliance. A manufacturer's certificate of compliance, which includes the name of the project and, when requested, copies of independent test results confirming compliance with specified requirements, shall be submitted to Engineer for the following materials:

   Membrane curing compound

   Epoxy bonding agent.

PART 2 PRODUCTS

2.01 LIMITING REQUIREMENTS.

A. Concrete shall be handled, placed, and cured in a manner that will minimize shrinkage and cracking as specified herein, and in accordance with Chapters 3 and 8 of ACI 224R. Concrete temperatures shall be controlled both before and after placement to minimize cracking. Any rise in concrete temperature caused by environmental conditions that will be conducive to excessive shrinkage shall be controlled with blankets or other acceptable means of insulation.

2.02 MATERIALS.

	Burke "Finishing Aid Concentrate", Euclid "Eucobar", L&M Chemical "E-Con", Master Builders "Confilm", or Sika "Sikafilm".
Epoxy Bonding Agent	ASTM C881, Type V, moisture insensitive, 100 percent solids; Master Builders "Concresive Paste LPL" , Euclid "Euco #352 or #452"or Prime Resins "Prime Bond".
Membrane Curing Compound and Floor Sealer VOC – EPA	ASTM C1315, Type I, Class A, maximum VOC 5.8 lb/gal], minimum 25 percent solids, acrylic, nonyellowing, unit moisture loss 0.40 kg/m^2 maximum in 72 hours; L&M Chemical "Lumiseal Plus", Sonneborn "Kure-N-Seal 30 ", or Euclid Chemical "Super Diamond Clear".

PART 3 EXECUTION

3.01 RECEIVING.

A. Contractor shall check each delivery ticket to verify the concrete class delivered to the jobsite is in compliance with the concrete requested and is suitable for Contractor's handling, placing, finishing, and curing procedures. Engineer shall collect the delivery tickets from the truck operator.

3.02 PLACEMENT.

A. The limits of each concrete pour shall be determined by Contractor and shall be acceptable to Engineer. All concrete within the predetermined limits shall be placed in one continuous operation.
Before concrete is placed, forms, reinforcement, water stops, anchor bolts, and embedments shall be rigidly secured in proper position; all dirt, mud, water, and debris shall be removed from the space to be occupied by concrete; all surfaces encrusted with dried concrete from previous placements shall be cleaned; and the entire installation shall be acceptable to Engineer. Remove all frost, ice, and snow from within the formwork before concrete is placed.

B. Contractor shall inform Engineer at least 24 hours in advance of the times and places at which he intends to place concrete.

1. Bonding to Hardened Concrete. The surface of hardened concrete upon which fresh concrete is to be placed shall be rough, clean, sound, and damp. Before placement of plastic concrete, the hardened surface shall be cleaned of all laitance and foreign substances (including curing compound), washed with clean water, wetted thoroughly, and the surface made free of standing water. Surface profile of the hardened concrete after surface preparation shall be as required for good bond.

   Coarse aggregate shall be omitted from the first batch or batches of concrete placed on hardened concrete in wall or column forms. The mortar puddle, Class A4 concrete, shall cover the hardened concrete by at least 2 inches at every point.

2. Conveying Concrete. Methods of conveying concrete to the point of final deposit shall prevent segregation or loss of ingredients. After placement in the forms, concrete shall not be moved laterally more than 5 feet. Concrete's free fall should not exceed 4 feet.

3. Pumping Concrete. The slump of concrete, with or without a superplasticizer,that is discharged into the pump may exceed the specified maximum slump value by the amount of slump loss in the pumping system, up to a maximum of 1 inch]. The slump loss shall be determined by tests made at each end of the pumping system. If tests indicate a slump loss greater than 1 inch in the pumping system, Contractor shall modify the pumping system as required to reduce the slump loss to 1 inch or less.

4. Placing Concrete. For proper compaction, concrete shall be placed in approximately horizontal layers not to exceed 24 inches. Each layer of concrete shall be plastic when covered with the following layer, and the rate of vertical rise of the concrete in the forms shall be not less than 24 inches per hour.

5. Compaction. During and immediately after placement, concrete shall be thoroughly compacted and worked around all reinforcement and embedments and into the corners of the forms. Mechanical vibrators shall maintain at least 14,000 cycles per minute when immersed in the concrete. The number and type of vibrators shall be acceptable to Engineer. The use of "jitterbug" tampers to compact concrete flatwork will not be permitted.

6. Cold Weather Concreting. Except as modified herein, cold weather concreting shall comply with ACI 306R. The temperature of concrete at the time of delivery shall not be less than that indicated in the Cast-in-Place Concrete section for corresponding outdoor temperature (in shade) at the time of placement.

When placed, heated concrete shall not be warmer than 80°F. When freezing temperatures may be expected during the curing period, the concrete shall be maintained at a temperature of at least 50°F for 5 days or 70°F for 3 days, after placement. Concrete and adjacent form surfaces shall be kept continuously moist. Sudden cooling of concrete shall not be permitted.

7. Hot Weather Concreting. Except as modified herein, hot weather concreting shall comply with ACI 305R. At air temperatures of 90°F or above, concrete shall be kept as cool as possible during placement and curing. The temperature of the concrete when placed in the work shall not exceed the values indicated in the Cast-in-Place Concrete section.

   Plastic shrinkage cracking due to rapid evaporation of moisture shall be prevented. Concrete shall not be placed when the evaporation rate (actual or anticipated) equals or exceeds 0.2 lb per square foot per hour], as determined by Figure 2.1.5 in ACI 305R.

8. Placement Sequence. To minimize the effect of shrinkage in producing cracks, concrete shall be placed as follows:

   a. Slabs. Each slab shall be divided into sections by the construction joints indicated on the drawings and, when not indicated on the drawings, into approximately square sections not greater than 60 feet in their longest dimension.

   No two abutting sections shall be placed within a period of 48 hours, unless otherwise authorized by Engineer.

9. Duct Banks. Duct bank concrete shall be compacted by rodding or spading only. Mechanical vibrators shall not be used. Concrete shall be worked around reinforcement and embedments and into the corners of the forms.

3.03 FINISHING UNFORMED SURFACES.

A. Buried and permanently submerged concrete blocking and encasement will require no finishing except as necessary to obtain the required surface elevations or contours. The unformed surfaces of all other concrete shall be screeded and given an initial float finish followed by additional floating, and troweling where required.

   1. Screeding shall produce a concrete surface conforming to the proper elevation and contour, with all aggregates completely embedded in mortar.

2. Application of Pre-Cure Finishing Aid. Concrete flatwork subject to rapid evaporation due to hot weather, drying winds, and sunlight shall be protected with a pre-cure finishing aid. The finishing aid shall form a monomolecular film on the surface of fresh, plastic concrete to retard evaporation.

   Immediately following screeding, pre-cure finishing aid shall be sprayed over the entire surface of fresh, plastic concrete flatwork at a rate of not less than 200 square feet per gallon, in accordance with the manufacturer's recommendations. The spray equipment shall have sufficient capacity to continuously spray finishing aid at approximately 40 psi with a suitable nozzle as recommended by the manufacturer.

   The sprayable solution shall be prepared as recommended by the manufacturer.

   Under severe drying conditions, additional applications of finishing aid may be required following each floating or troweling, except the last finishing operation.

3. Floating. Screeded surfaces shall be given an initial float finish as soon as the concrete has stiffened sufficiently for proper working. Any piece of coarse aggregate which is disturbed by the float or which causes a surface irregularity shall be removed and replaced with mortar. Initial floating shall produce a surface of uniform texture and appearance, with no unnecessary working of the surface.

   Initial floating shall be followed by a second floating at the time of initial set. The second floating shall produce a finish of uniform texture and color, and unless additional finishing is specifically required, shall produce the completed finish for unformed surfaces.

   Floating shall be done with hand floats or suitable mechanical compactor-floats.

4. Finishing Surfaces for Bonding. All surfaces to be covered with concrete or topping shall be float finished. All laitance, surface mortar, and unsound material shall be removed by brushing or air blasting at the time of initial set. Surfaces shall be rough, clean, and sound. Floors and other flat surfaces to receive composite topping (Class D6) shall be given a broom finish or raked finish with at least a 1/4 inch] profile.

5. Troweling. Interior floor surfaces which will be exposed after construction is completed; surfaces to be covered with resilient floor coverings, thinset terrazzo, or seamless floor covering;

exposed top surfaces of equipment bases and interior curbs; and other surfaces designated on the drawings shall be steel trowel finished. Surfaces to be covered with elastomeric deck covering shall be lightly troweled but not burnished. Trowel finishing will not be required for floors which are normally submerged. Troweling shall be performed after the second floating when the surface has hardened sufficiently to prevent an excess of fines being drawn to the surface. Troweling shall produce a dense, smooth, uniform surface free from blemishes and trowel marks.

6. Edging. Unless specified to be beveled, exposed edges of floated or troweled surfaces shall be edged with a tool having at least a 1/8 inch corner radius.

7. Broom Finish. Where required, concrete surfaces shall be given a light broom finish to produce a nonslip surface. Brooming shall be done after the second floating and at right angles to the normal direction of traffic.

   Broom finish shall be provided at the following locations:

   a) exterior stairs

8. Pavement Finishing. The surface of pavements shall not vary more than 1/8 inch under a 10 foot straightedge placed parallel to the center line.

   Following placement and consolidation, and the disappearance of bleed water, the concrete surface shall be drag finished, using a seamless strip of damp burlap over the full width of the surface. The burlap drag shall consist of sufficient layers of burlap and shall have sufficient length in contact with the concrete to slightly groove the surface. The drag shall be moved forward with a minimum bow of the lead edge. The drag shall be kept damp, clean, and free of particles of hardened concrete. When acceptable to Engineer, carpet, artificial turf, or cotton fabric may also be used.

   Following placement and consolidation, and the disappearance of bleed water, the concrete surface shall be broom finished with a broom acceptable to Engineer. The broom shall not be less than 18 inches wide and made from good quality bass or bassine fibers not more than 5 inches long. The broom finishing shall produce regular corrugations not over 1/8 inch deep. The broom shall be pulled square across the surface, from edge to edge, with adjacent stroked slightly overlapped, and shall not tear the concrete surface. Following placement and consolidation, and the disappearance of bleed water, the concrete surface shall be grooved in the transverse direction, using a wire broom or comb

with a single row of tines. Unless otherwise permitted by Engineer, the grooving shall be at least 1/8 inch wide at ¾ inch centers, and the groove depth shall be approximately 1/8 inch. The transverse grooving shall terminate approximately 1 foot from the gutter line at the base of the curb. The area adjacent to the curb shall be given a light broom finish longitudinally.

9. Curb and Gutter Finishing. Curb and gutter shall be finished to the shape indicated on the drawings. After the forms have been removed, all exposed edges shall be rounded, using an edging tool with at least a 1/8 inch corner radius. Exposed surfaces shall be float finished and given a light broom finish applied at right angles to the curb at the time of initial set, using a horsehair type broom.

10. Sidewalk Finishing. Concrete surfaces shall be screeded to the proper elevation and contour. All aggregates shall be completely embedded in mortar. Screeded surfaces shall be given an initial float finish as soon as the concrete has stiffened sufficiently for proper working. Any piece of coarse aggregate which is disturbed by the float or which causes a surface irregularity shall be removed and replaced with mortar. Initial floating shall produce a surface of uniform texture and appearance, with no unnecessary working of the surface. Initial floating shall be followed by a second floating at the time of initial set.

    Floated surfaces shall be given a light broom finish, using a horsehair broom, to provide a nonslip surface. Brooming shall be done at right angles to the length of the walk.

    Sidewalks shall be edged using a 3 or 4 inch wide edging tool with a 1/8 inch corner radius. Edger lap marks at corners of each slab shall be carefully removed. False joints shall be provided at right angles to the length of the walk, using a grooving tool with 1/8 inch radius. The finished edge on each side of the joint shall be the same width as the edging tool used. False joints shall divide each sidewalk into square sections.

    The finished surface of all sidewalks shall be neat in appearance, shall be sloped to drain, and shall not pond water.

3.04 FLOOR SEALER.

A. All concrete floors which are subject to foot traffic and are not required to be covered with resilient floor coverings, thinset terrazzo, seamless flooring, ceramic tile, or quarry tile shall be given two coats of clear floor sealer in addition to any which may have been applied as membrane curing compound. Prior to application of each coat of sealer, the floor shall be thoroughly cleaned of dirt, grease, and other foreign matter. The

first coat shall be applied at the end of the curing period and before any traffic is permitted on the floor. The second coat shall be applied in preparation for substantial completion of the work. Floor sealer shall be applied in accordance with the manufacturer's recommendations.

3.05 CURING.

A. Concrete shall be protected from loss of moisture for at least 7 days after placement; however, when concrete is also being protected from low temperatures, the period of curing by saturation shall be 1 day less than the duration of the low temperature protection. Curing of concrete shall be done by methods which will keep the concrete surfaces adequately wet for the specified curing period.

B. When forms are removed before the specified curing is completed, measures shall be taken to immediately continue curing and to provide adequate thermal protection for the concrete.

1. Water Curing. Water saturation of concrete surfaces shall begin as soon as possible after initial set. The rate of water application shall be regulated to provide complete surface coverage with a minimum of runoff. Acceptable methods of water curing are described in ACI 308. The application of water to walls may be interrupted for grout cleaning only over the areas being cleaned at the time, and the concrete surface shall not be permitted to become dry during such interruption.

2. Membrane Curing. Unless otherwise specified, membrane curing compound may be used instead of water curing on concrete in non-liquid-containing structures which will not be covered later with topping, mortar, coating, or additional concrete.

Membrane curing compound shall be sprayed at a coverage rate of not more than 300 square feet per gallon. The spray equipment shall have sufficient capacity to continuously spray curing compound at approximately 40 psi with a suitable nozzle as recommended by the manufacturer. Unformed surfaces shall be covered with the first coat of curing compound within 30 minutes after final finishing. A second coat of curing compound shall be applied when the first coat has become tacky to the touch and shall be applied at right angles to the first coat. If forms are removed before the end of the specified curing period, curing compound shall be immediately applied to the formed surfaces.

Concrete surfaces shall be covered with white polyethylene sheeting immediately after the curing compound has become dry to the touch. White polyethylene sheeting shall completely cover the surfaces and shall overlap the edges for proper sealing and anchorage. Joints between sheets shall be sealed. All tears,

holes, and other damage shall be promptly repaired. Covering shall be anchored continuously at edges, and shall be anchored as necessary to prevent billowing on the surface.

Curing compound shall be suitably protected against abrasion during the curing period.

3. Film Curing. Unless otherwise specified, film curing with white polyethylene sheeting may be used instead of water curing on concrete in nonliquid-containing structures which will be covered later with mortar or additional concrete, or which will otherwise not be exposed to view.

Film curing shall begin as soon as possible after initial set of the concrete. The concrete surfaces shall be completely covered with polyethylene sheeting. Sheeting shall overlap the edges of the concrete for proper sealing and anchorage, and joints between sheets shall be sealed. All tears, holes, and other damage shall be promptly repaired. Covering shall be anchored continuously at edges and as necessary to prevent billowing on the surface.

3.06 REPAIRING DEFECTIVE CONCRETE.

A. Defects in formed concrete surfaces shall be repaired within 24 hours to the satisfaction of Engineer. Defective concrete shall be replaced within 48 hours after the adjacent forms have been removed. All concrete which is honeycombed or otherwise defective shall be cut out and removed to sound concrete, with edges cut square to avoid feathering.

B. Concrete repair work shall conform to Article 5.3.7. of ACI 301 and shall be performed in a manner that will not interfere with thorough curing of the surrounding concrete. Repair work shall be adequately cured.

3.07 FINISHING FORMED SURFACES.

A. Fins and other concrete surface projections shall be removed from all formed surfaces, except exterior surfaces that will be in contact with earth backfill and are not specified to be dampproofed. A power grinder shall be used, if necessary. Surfaces to be dampproofed shall have fins removed and tie holes filled, but no additional finishing will be required.

3.08 TOLERANCES.

A. Tolerances for cast-in-place concrete work shall be as stipulated in ACI 117, unless otherwise indicated.

3.09 CLEANING EMBEDMENTS.

A. Embedments shall be clean when installed. After placement of concrete, surfaces of embedments not in contact with concrete shall be cleaned of concrete spatter and other foreign substances.

END OF SECTION

SECTION 03462
PRECAST CONCRETE VAULTS

PART 1 GENERAL

1.01 DESCRIPTION

A. This section includes the materials, manufacture, and installation of precast concrete vaults, vault frames and covers.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 01300 - Submittals

B. Section 02200 - Earthwork

C. Section 03300 - Cast-in-Place Concrete

D. Section 07160 - Dampproofing

1.03 SUBMITTALS

A. Stamped calculations and drawings by a California Registered Engineer shall be submitted conforming to Specification Section 01300, "Submittals."

PART 2 MATERIALS

2.01 PRECAST CONCRETE VAULT

A. Precast concrete vaults and covers shall be manufactured in a plant specifically designed for that purpose and shall conform to the shapes and dimensions indicated on the plans.

B. Design loads shall consist of dead load, live load, impact, and in addition, loads due to water table and any other loads that may be imposed upon the structure. Live loads shall be for HS-20 per AASHTO standard specifications for highway bridges. Design wheel load shall be 16 kips. The live load shall be that which produces the maximum shears and bending moments in the structure.

C. Concrete shall have minimum compressive strength of 4,000 psi conforming with ASTM C 94.

D. The vault floor shall be treated such that a non-skid surface is provided.

E. Precast vault shall be manufactured by Utility Vault, Jensen Precast or City approved equal.

2.02 VAULT FRAMES AND COVERS

A. Vault frame and covers shall be of the type and size shown on the plans with drainage pipe routed to the vault sump.

B. Covers shall have spring or hydraulic assist mechanism for one person operation.

C. All covers shall be HS-20 traffic, intermittent use, rated unless specified otherwise. Covers may be aluminum or galvanized steel to suit the specific size and loading configurations. Provide neoprene foam all around each cover leaf where it contacts the frame to dampen noise.

D. Frames and covers shall be Bilco Model JD-H20 or City approved equal

2.03 JOINT SEALING COMPOUND

A. The joint sealing compound shall be a permanently flexible waterproof plastic material complying in every detail to Federal Specification SS S-00210 (GSA-FSS). "Conseal", "Quickseal," or approved equal.

2.04 WATERPROOFING

A. Waterproofing shall be in compliance with Specification Section 07160, "Dampproofing".

PART 3 EXECUTION

3.01 EARTHWORK

A. Excavation and backfill for precast concrete vaults shall be in accordance with Specification Section 02200, "Earthwork" and the requirements herein.

B. The Contractor shall prepare an excavation large enough to accommodate the structure and permit grouting of openings and backfilling operations.

C. The bottom of the structure shall be placed on compacted, crushed rock sub-base, depth as indicated, graded level and to the proper elevation as shown on the plans, unless otherwise indicated by the Engineer.

3.02 INSTALLATION

A. Openings or "knockouts" in precast concrete vaults shall be located as shown on the drawings and shall be sized sufficiently to permit passage of the largest dimension of pipe and/or coupling flange. Upon completion of installation, all voids or openings in the vault walls around pipes shall be filled with 3,000-psi concrete or mortar, using an approved epoxy for bonding concrete surfaces.

B. After the structure and all appurtenances are in place and approved, backfill shall be placed such that finished grade is sloped away from vault (in unpaved areas) or such that vault is flush with finished grade (in paved areas) to the original ground

line or to the limits designated on the plans, unless otherwise indicated by the Engineer.

C. All joints between precast concrete vault sections shall be made watertight using preformed mastic material. The sealing compound shall be installed according to the manufacturer's recommendations to provide a watertight joint that remains impermeable throughout the design life of the structure. All joints shall be filled with dry-pack non-shrink grout.

D. Frames and covers shall be built up so that the cover is flush with the surrounding surface unless otherwise specified on the plans or by the Resident Engineer in the field. The Contractor is responsible for placing the cover at the proper elevation where paving is to be installed and shall make all necessary adjustments so that the cover meets these requirements.

E. Dampproofing shall be applied where indicated to the exterior walls of all buried vaults in accordance with the manufacturer's instructions and Specification Section 07160, Damproofing". Protection shall be placed over the waterproofing to prevent damage.

END OF SECTION

SECTION 03600
GROUT

PART 1 GENERAL

1.01 SCOPE.

A. This section covers procurement and installation of grout. Unless otherwise specified, only nonshrink grout shall be furnished.

B. Epoxy grouting of anchor bolts, threaded rod anchors, and reinforcing bars is covered in the anchorage in concrete and masonry section. Grouting of masonry is covered in the building masonry section.

1.02 SUBMITTALS.

A. A letter of certification indicating the types of grout to be supplied and the intended use of each type shall be submitted in accordance with the submittals section.

1.03 DELIVERY, STORAGE, AND HANDLING.

A. Materials shall be handled, transported, and delivered in a manner which will prevent damage of any kind. Materials shall be protected from moisture.

PART 2 PRODUCTS

2.01 MATERIALS.

Nonshrink Grout	ASTM C1107.
Water	Clean and free from deleterious substances.

2.02 NONSHRINK GROUT.

A. Nonshrink grout shall be furnished factory premixed so that only water is added at the jobsite. Nonshrink grout shall have a minimum compressive strength of 5,000 psi in 7 days.

PART 3 EXECUTION

3.01 PREPARATION.

A. The concrete foundation to receive nonshrink grout shall be saturated with water for at least 12 hours preceding grouting unless additional time is required by the grout manufacturer.

3.02 INSTALLATION.

1. Mixing. Grout shall be mixed in a mechanical mixer. No more water shall be used than is necessary to produce a flowable grout.

2. Placement. Unless otherwise specified or indicated on the drawings, grout under baseplates shall be 1-1/2 inches [38 mm] thick. Grout shall be placed in strict accordance with the directions of the manufacturer so that all spaces and cavities below the baseplates are completely filled without voids. Forms shall be provided where structural components of baseplates will not confine the grout.

3. Edge Finishing. In all locations where the edge of the grout will be exposed to view, the grout shall be finished smooth after it has reached its initial set. Except where shown to be finished on a slope, the edges of grout shall be cut off flush at the baseplate.

4. Curing. Nonshrink grout shall be protected against rapid loss of moisture by covering with wet cloths or polyethylene sheets. After edge finishing is completed, the grout shall be wet cured for at least 3 days and then an acceptable membrane curing compound shall be applied.

END OF SECTION

SECTION 04200
BUILDING MASONRY

PART 1 GENERAL

1.01 SCOPE.

A. This section covers the furnishing and installing of building masonry.

1.02 GENERAL.

A. Building masonry shall be constructed of units of the types, dimensions, arrangements, and coursing indicated on the drawings and specified herein, complete with all materials, accessories, and appurtenances indicated and specified.

B. Concrete masonry units shall be produced by a company certified in the Quality Control Program of the California Concrete Masonry Technical Committee.

C. Special Inspection shall be provided by the Contractor as indicated on the drawings.

1.03 DELIVERY, STORAGE, AND HANDLING.

A. Shipping shall be in accordance with the Shipping section. Handling and storage shall be in accordance with the Handling and Storage section.

B. All masonry units shall be handled in a manner which will prevent soiling, chipping, or damage of any kind. Broken, discolored, chipped, or otherwise damaged facing units will be rejected and shall be replaced with undamaged units.

C. Masonry units shall be stored on pallets, shall be protected against contamination and staining, and shall be kept covered and dry at all times. Lime and cement shall be stored under cover in a dry place.

D. Sand shall be stored so that the inclusion of foreign materials is prevented. Whenever sand is piled directly on the ground, the surface beneath the sand shall be smooth, well drained, and free from dust, mud, and debris. The bottom 6 inches [150 mm] of each pile shall not be used in mortar.

1.04 SUBMITTALS.

A. Before masonry construction is begun, the following drawings, data, specimens, and samples shall be submitted in accordance with the Submittals section. Additional data shall be submitted as needed. If the source of a material is changed during the course of the work, the tests

and reports required for preliminary review of that material shall be resubmitted.

- Specimens, performance data, and color selection kits for all masonry units which will be used in project construction, showing range of colors, textures, finishes, and dimensions.
- Manufacturer information and data for any admixture, mortar coloring, or product added to the grout or mortar.
- Color selection sample kits for integral mortar colors.
- One sample, at least 6 inches [150 mm] long, of each type of non-masonry joint material required.
- Shop drawings or manufacturers' literature showing details of anchors, ties, and metal accessories to be used in masonry construction.
- Bar lists and drawings for the fabrication and placement of reinforcement with sufficient elevations and sections to adequately detail and label all reinforcement.
- Cold and hot weather construction procedures.
- Certificates for the following materials used in masonry construction, indicating compliance with the standards herein. Verification of f'm will be required every 5000 square feet during construction of essential facilities.
- Masonry units.
- Mortar and grout materials.
- Reinforcement.
- Anchors, ties, fasteners, and metal accessories.
- For each mortar mix, one of the following:
- Mix designs indicating type and proportions of ingredients in compliance with the proportion specification of ASTM C270.
- Mix designs and mortar tests performed in accordance with the property specification of ASTM C270.
- For each grout mix, one of the following:
- Mix designs indicating type and proportions of ingredients in compliance with the proportion requirements of ASTM C476.
- Mix designs and grout strength tests performed in accordance with ASTM C476.

1.05 COLORS AND SAMPLES.

A. Colors of masonry units and colored mortar will be selected from manufacturers' data and samples after the award of the contract.

1.06 MASONRY UNITS.

A. Colors for face brick, glazed masonry units, or integral colored masonry units shall be selected from manufacturers standard and custom color

selections. Different colors may be required for each type of masonry unit or for different locations of the same type of masonry unit. Special color patterns shall be as indicated on the drawings. General color selections shall be made from manufacturers' data. After general color selections are made, sample masonry boards shall be submitted to Engineer for preliminary color selections. These boards shall be of sufficient size to show the proposed shade distribution and shall be submitted in as many different colors, textures, arrangements, and shade combinations as may be required for making a proper selection. Boards shall be at least three courses high and three stretcher units wide laid up in running bond. Units need not be full depth. The preliminary color and texture selections shall be used for submitting the full size units and in constructing the sample panels specified herein. All color, shade, and texture selections shall not be final until the field constructed sample panel has been accepted.

1.07 MORTAR.

A. When integral mortar color is required, color will be selected from sample kits submitted. After general color selections have been made, mortar samples shall be prepared for color selection. As many samples as are necessary to make a proper selection shall be prepared. Preliminary color selections shall be used in constructing the sample panels. Mortar colors shall not be final until the sample panels have been accepted.

1.08 SAMPLES.

A. Samples of all masonry units and mortar shall be submitted as indicated in the Submittals section. At least two samples of each type of unit required shall be submitted.

1.09 SAMPLE PANELS.

A. Before the installation of any masonry materials, sample panels shall be constructed at the building site incorporating each type of masonry material. Sufficient number of sample panels shall be constructed to show each type of exterior and interior wall configuration and bonding patterns indicated on the drawings. Unless otherwise indicated or detailed on the drawings, sample panels shall be 6'-8" [2.0 m] long by 4'-0" [1.2 m] high. Sample panels shall show the proposed color range, texture, bonding patterns, mortar joints, mortar color, and workmanship for masonry materials. Each panel shall be of the thickness indicated on the drawings for building walls of similar construction. The panels shall be representative of each typical exterior and interior masonry wall construction indicated on the drawings complete with, as applicable, masonry units, bonding patterns, joint reinforcement, wall ties, wall insulation, vertical steel, a typical bond beam, mortar color, mortar tooling, weeps, and flashings. Each sample panel shall include a typical control joint complete with filler strips and caulking as indicated on the drawings.

The sample panels shall not be incorporated into the work. No masonry work shall progress until Engineer has accepted the sample panels. The panels shall then become the standard of comparison for all masonry work built of the same materials. The panels shall not be destroyed or moved until all masonry work is completed.

B. At least one exterior wall panel shall include an intersecting interior wall constructed as detailed on the drawings.

C. Masonry construction shall not begin until Engineer has reviewed the applicable submittals for strength of masonry units and mortar.

PART 2 PRODUCTS

2.01 MATERIALS.

A. All acceptable masonry products are indicated below. Products necessary for the work are as specified or as indicated on the drawings. Sizes of masonry units are nominal, the actual size being slightly smaller to allow for mortar joints. Provide units made with integral water repellant. Integral water repellant admixture shall be ACM chemistries; "Rainbloc", W.R Grace; "Dry-Block" or equal.

Concrete block	ASTM C90, 8 inch x 16 inch and 12 inch x 16 inch face dimensions, sizes with special shapes as indicated on the drawings; regular aggregate conforming to ASTM C331 or C33
Regular type	Sizes, special shapes, and face pattern as indicated on the drawings. Match color of exterior split face block. Standard weight aggregate units.
Color range	Tans
Texture	Random broken face
Scoring	No score
Sand	ASTM C144, natural sand; 95 percent passing No. 16 [1.18 mm] sieve, for glazed tile and stone mortar; white, 95 percent passing No. 50 [300 µm] sieve, for pointing mortar.
Pea Gravel	ASTM C33, coarse aggregate, 90 percent passing 3/8 inch [9.5 mm] sieve, 90 percent retained on No. 4 [4.75 mm] sieve.

Portland Cement	ASTM C150, Type I.
Hydrated Lime	ASTM C207, Type S.
Quicklime	ASTM C5, pulverized.
Lime Putty	Quicklime, thoroughly slaked and stored for one day; kept moist until used.
Integral Mortar Color	ASTM C979, mineral pigments, natural or synthetic iron oxides, sun fast and water resistant, free of fillers and extenders. Soloman Grind-Chem Service, Inc. "A", "H", or "X" series.
False Joint Mortar	ANSI A118.4, Type S, Portland cement mortar with latex admixture, color to match mortar color.
Integral Waterproofing	Aluminum stearate, ammonium stearate, or calcium stearate, 2 percent of weight of cement; W. R. Grace "Dry-Block Mortar Admixture" or ACM chemistries "Rainbloc" or equal
White Cement	Atlas White, Medusa White, or Trinity White.
Prepared Joint Filler	ANSI A118.6 Sanded tile grout. Laticrete Series 500 joint filler, Bonsal "Sanded Grout" or Bostik "Hydroment Joint Filler".
Water	Clean and free from deleterious substances.
Rebar Positioner	9 gage [3.80 mm thick] wire, sized for block thickness, single or double bar type, galvanized ASTM A153, Class B-2.
Reinforcing Steel	ASTM A615, Grade 60, except No. 3 [9.5 mm] bars which may be either Grade 40 or Grade 60, deformed.
Control Joint Material	ASTM D1056, Type 2, Class A-1, PVC foam with pressure-sensitive adhesive back; Dur-O-Wall "Rapid Soft-Joint" or Hohmann & Barnard "NS" Neoprene.
Preformed Control Joint	ASTM D2287, PVC Synthetic rubber; Dur-O-Wall "Rapid Control Joint" or Hohmann & Barnard "VS' Series.

Detergent Masonry Cleaner	ProSoCo "Vana-Trol" or National Chem-Search "DC-6", unless otherwise recommended by the masonry unit manufacturer and accepted by Engineer.

Wall flashings are covered in the Sheet Metal section.

2.02 MORTAR.

A. The method of measurement of all mortar ingredients shall be accurate and shall ensure definite and uniform proportions. All mortar ingredients shall be mixed on site. The use of masonry cement or premixed ingredients will not be acceptable, unless authorized by Engineer.

2.03 MASONRY MORTAR.

A. Masonry mortar shall conform to ASTM C270, except as modified herein. Mortar shall be machine mixed for at least 5 minutes and shall be used within 90 minutes after mixing. Mortar left when work is stopped shall be discarded. Remixing of mortar more than 90 minutes old with additional water, cement, or other materials will not be acceptable.

B. Unless otherwise indicated, mortar shall be cement-lime Type S, and shall conform to the proportion specifications of ASTM C270.

C. The sand content specified above is maximum quantity. White cement shall be substituted for Portland cement for cut stone mortar. Integral waterproofing shall be added to each mortar mixture.

2.04 INTEGRAL MORTAR COLOR.

A. Integral mortar coloring shall be added to the mortar for masonry as specified herein. All other joints shall be standard gray mortar. Integral mortar coloring shall be added to the mortar mix as recommended by the mortar color manufacturer. The manufacturer's mixing instructions and proportions shall be strictly adhered to. Each mortar color shall be of consistent color throughout the project. Mortar shall be mixed in a power mixer until a uniform color is obtained, but not less than 5 minutes.

B. Where indicated on the drawings, latex modified joint grout for false joints in scored concrete masonry units shall be colored to match mortar color.

2.05 GROUT FILL.

A. Grout fill for filling bond beams and other reinforced masonry shall be concrete grout meeting the requirements of ASTM C476 . Grout shall be coarse and shall be proportioned by volume in accordance with Table 1 of ASTM C476. Only enough water shall be added to produce a mixture

which is flowable, but which will not show an excess of water when placed. Unless otherwise specified, grout fill shall have a slump ranging from 8 to 11 inches [200 to 275 mm].

PART 3 EXECUTION

3.01 MORTAR JOINTS.

A. Masonry shall be laid in straight, level, uniform courses, with mortar joints of uniform width. Head joints shall approximately equal the horizontal joints in width.

B. Modular brick shall be laid so that three courses will produce 8 inches [200 mm] of wall height. Other brick types and structural glazed tile shall be laid as indicated on the drawings.

C. All solid masonry units and hollow units with horizontal cells shall be laid on a full bed of mortar. All units in masonry columns and pilasters shall be laid on a full bed of mortar. Web joints of all cores which will be subsequently filled with grout fill shall be fully mortared. Walls which are to be fully grouted may be laid with face shell bedding.

D. The filling of masonry joints shall mean that the entire space between abutting surfaces of units is full, and that the body of the mortar is forced against and into the porous surface of each unit.

E. All exterior and exposed interior mortar joints, except joints in glazed materials, joints in walls which are to be covered, and joints which are to be raked, shall be tooled to a smooth uniform surface and shall be finished free of voids using a rounded tool. Mortar joints specified to be caulked shall be raked to a depth of 1/2 inch [12.7 mm]. Tooling of joints shall be regulated so that the mortar for each wall space has a uniform appearance.

F. Joints in masonry surfaces which are to be covered or not exposed shall be struck flush.

3.02 BONDING AND REINFORCING.

A. Except where otherwise indicated on the drawings, all facing brick and concrete block shall be laid in running bond. Special bonding patterns shall be as indicated on the drawings. All masonry shall be reinforced and anchored as indicated on the drawings and as specified herein.

3.03 REINFORCING STEEL.

A. Concrete block bond beam units shall be provided, installed and reinforced with reinforcing steel where required and as indicated on the

drawings. Bond beam units shall be filled with grout fill as specified herein. Reinforcing steel shall be continuous around corners. At control joints, 50 percent of the bond beam reinforcing shall be discontinuous unless otherwise indicated on the drawings.

B. Vertically reinforced concrete block cores shall be provided as indicated on the drawings. Reinforcing shall be accurately placed and securely tied to prevent shifting during core filling. Bar positioners shall be used for alignment. Positioners shall be placed in the bottom and top courses of walls and at not more than 4 feet [1,200 mm] centers between. Mortar fins which project into cores more than 1/2 inch [13 mm] and all loose mortar and debris shall be removed before filling the cores. Cores shall be filled with grout fill as specified herein.

C. When accepted by Engineer, open-ended concrete masonry units may be substituted for units with end webs in reinforced concrete masonry walls.

D. Special bond beam units with open or knockout webs and open vertical cells shall be used for bond beams. U-shaped lintel units shall be used only in bond beams over openings. If the cells beneath a bond beam are not required to be grouted, wire mesh material may be used in the joint to retain the grout fill.

3.04 GROUT FILL.

A. Unless otherwise acceptable to Engineer, grout fill shall be placed in lifts not to exceed 5 feet [1.5 m]. Pours exceeding 12 inches [300 mm] in height shall be consolidated by mechanical vibration and reconsolidated after initial water loss and settlement. Bond beam fill shall not be mechanically vibrated. Grout fill shall be placed in reinforced block cores, bond beams, lintels, and in other locations indicated on the drawings.

B. All concrete block masonry shall be grouted solid.

3.05 LAYING MASONRY UNITS.

A. All masonry units shall be free from dust, dirt, and surface moisture when laid. Concrete blocks and glazed blocks shall be dry when laid.

B. All masonry shall be laid to a line. Walls shall be plumb and straight and in level courses. At no time shall any part of masonry construction project more than 8 feet [2.4 m] above adjacent work. When work is suspended, the tops of exterior masonry walls shall be covered and protected from the weather.

C. Care shall be taken in corner construction and at jambs to maintain uniformity of appearance and to ensure that only whole, undamaged units

are used. All patterned masonry units shall have special corner units installed at exposed corners to maintain consistency of patterns.

D. Custom scored masonry and other units laid in stack bond shall be carefully plumbed so that vertical joints will form uniform continuous vertical lines and will be uniform in width, texture, and general appearance. Units shall be of uniform length and shall he trimmed as necessary.

E. Unless otherwise indicated, masonry units laid in running bond in exposed locations shall be so constructed that vertical joints in alternate courses lie in the same vertical lines, midway between the vertical joints in adjacent courses to provide a regular and uniform joint pattern. All custom scored units shall be aligned as detailed on the drawings.

F. Masonry units shall be saw-cut to provide openings and to accommodate embedded items. Anchors shall be securely embedded in mortar. Door and window frames shall be maintained plumb and true. Masonry shall be built tightly against interior door frames. A caulking space shall be provided between exterior door frames and masonry in accordance with the details indicated on the drawings. The jambs of built-in hollow metal door frames shall be completely filled with grout fill or mortar.

G. Lintels shall be provided over all openings wider than the length of a masonry unit. Lintels shall be of the types and sizes indicated on the drawings or as needed, and shall be acceptable to Engineer.

H. Reinforced lintels and other wall reinforcing as needed and indicated on the drawings shall be provided and installed hereunder. Reinforced lintels shall be filled with grout fill.

I. All embedded items shall be set and securely anchored in the masonry work as indicated on the drawings or as acceptable to Engineer. Joints between masonry and embedded items shall be pointed.

J. Where indicated on the drawings, the unfilled cores of concrete block or glazed block walls shall be filled with loose insulation. The insulation shall be poured into the space as the work progresses, with care taken to fill all spaces and voids.

K. Masonry units shall be selected and laid so that the exposed face of each unit is free of broken corners, chipped edges, or other defects which would be detrimental to the appearance of the wall surface.

3.06 CONTROL JOINTS.

A. Control joints in masonry walls and in masonry walls abutting concrete wall surfaces shall be constructed as indicated on the drawings. Where

indicated on the drawings, preformed control joint strips shall be placed in the wall as construction proceeds, with masonry units laid tight against the strips. Where required, joint filler strips shall have a thickness equal to at least 1-1/2 times the nominal width of the joint. The filler strips shall be firmly bonded to one joint face by the adhesive backing, and shall be of required width to be held back 1/2 inch [13 mm] from each face for caulking, and placed under compression by the abutting masonry. All joints in filler strips shall be tightly butted.

3.07 ANCHORS, INSERTS, AND OTHER PENETRATIONS.

A. All necessary ties, anchors, bolts, inserts, sleeves for piping, conduits of every kind, window, louver and door frames, and other work shall be accurately set and securely held in the masonry work as indicated on the drawings or in a manner acceptable to Engineer. Sleeves shall be provided where small piping passes through the masonry.

3.08 LOW TEMPERATURES.

A. When the temperature of the surrounding air is below 40°F [4°C], or when the outdoor temperature is likely to fall below freezing at any time during the 24 hour day, the following precautions shall be taken to prevent freshly laid masonry from freezing:

a) In addition to the protection specified for ordinary conditions, masonry materials shall also be kept from contact with snow, ice, or dampness of any kind.

c) The temperature of the mixed mortar shall be between 70 and 120°F [21 and 49°C]. Mixing water shall be warm, but not above 165°F [74°C]. If necessary, sand shall be heated also. Mortar mixing equipment shall be heated before it is used. The use of salt or calcium chloride is not acceptable.

e) Masonry units shall be free of ice and snow and shall be above freezing when laid. If the outdoor temperature is below 30°F [-1°C]. units shall be heated to at least 40°F [4°C]. If the temperature is below 0°F [-17°C], units shall be heated to at least 60°F [15°C]. Heating shall be done so that the units are not damaged.

g) Masonry units shall not be laid on surfaces that are frozen or covered with snow or ice.

i) Masonry laid during freezing weather shall be kept warm for at least 3 days after laying. The air temperature at the masonry surface shall be kept between 45°F and 90°F [7°C and 32°C], using heating methods that will not unduly dry out or otherwise damage the masonry. Heat shall be applied to both sides of the wall, with provisions for proper circulation of air. The masonry shall be suitably housed or covered.

3.09 HIGH TEMPERATURES.

A. When the ambient air temperature exceeds 99°F [37°C] in the shade and the relative humidity is less than 50 percent, masonry shall be protected from direct exposure to wind and sun during and for 48 hours after erection.

3.10 FINISH TUCK POINTING.

A. On completion of the work, all exposed masonry shall be pointed where necessary and all voids and holes in the mortar shall be filled to match adjacent joint surfaces. Defective joints shall be cut out and repointed with mortar. Care shall be taken to produce a uniform overall appearance. Spottiness due to variations in either materials or workmanship will not be acceptable.

3.11 PROTECTION FROM DAMAGE.

A. Masonry and all embedded or built-in items shall be carefully protected from damage. Masonry walls discolored by paint, mortar, or concrete shall be rebuilt with new materials.

B. Where concrete is placed adjacent to on top of previously constructed masonry, the masonry shall be adequately protected against splashing of concrete paste and from other damage.

3.12 CLEANING.

A. Following finish pointing, all exposed masonry surfaces shall be cleaned to remove all surface stains and smears.

B. A detergent masonry cleaner shall be used to clean facing brick in accordance with the manufacturer's recommendations.

C. Mortar smears or droppings on concrete blocks shall be removed with a steel trowel after they have hardened to the extent that removal will not cause additional smearing. Any remaining mortar shall be removed to the extent possible by rubbing with a small piece of block. All surfaces shall then be thoroughly brushed.

D. If stains and smears cannot be removed by the specified methods, Contractor may propose alternative methods or cleaning products. These alternatives shall be acceptable to Engineer before they are used.

3.13 CITY'S FIELD CONTROL TESTING.

A. When required, field control tests will be performed by Engineer or a testing laboratory. Contractor shall provide all facilities and the services of one or more employees as necessary to assist with the field control testing.

B. As stipulated in Specification Section 01400, "Quality Requirements", special tests and inspections required during the progress of work will be made at the expense of Contractor.

C. The frequency specified for each field control test is approximate and subject to change as determined by Engineer.

3.14 GROUT.

A. Grout sampled during placement will be tested in accordance with ASTM C1019 at the rate of three specimens per 5,000 square feet [465 m^2] of wall. Compressive strength test shall be at 28 days after sample collection. Alternatively, grouted prisms may be constructed and tested in accordance with ASTM C1314 modified in accordance with ACI 530.1 at the rate of three specimens per 5,000 square feet [465 m^2] of wall.

END OF SECTION

SECTION 05312
STEEL ROOF DECK

1.01 GENERAL

1.02 SCOPE.

A. This section covers the design, fabrication, and erection of steel roof deck, including flashings, fastening devices, and other accessories and appurtenances as required and as indicated on the drawings.

1.03 DELIVERY, STORAGE, AND HANDLING.

A. Materials shall be handled, transported, delivered, and stored in a manner which will prevent bends, dents, scratches, or damage of any kind. Damaged deck units shall be promptly replaced.

B. All steel decking shall be stored on platforms, pallets and sloped to provide drainage. Contractor shall provide waterproofing covering and ventilate to prevent condensations.

1.04 SUBMITTALS.

A. Detailed fabrication and erection drawings covering the steel deck shall be submitted in accordance with the Submittals section.

B. Drawings shall indicate locations of roof framing supports and the depths, profiles, thicknesses, locations, lengths, and markings of deck units to correspond with the sequence of installation. Drawings shall indicate fastening methods for deck units, accessories, closure pieces, fittings, and auxiliary supports, and the type and sequence of welded connections.

C. Contractor shall submit welder certifications for review and approval.

PART 2 PRODUCTS

2.01 PERFORMANCE AND DESIGN REQUIREMENTS.

A. Except as modified or supplemented herein, or as otherwise indicated on the drawings, steel decking shall conform to the Basic Design Specifications of the Steel Deck Institute.

B. Metal thicknesses and gages of sheet metal used herein are the minimum required. Gages refer to US Standard gage.

C. Decking shall be designed to support a minimum total uniform load of 40 psf [2.0 kPa] unless otherwise required. Unit working stress shall not

exceed 20,000 psi [140 MPa] and deflection shall not exceed 1/240 of the span.

D. Joints in the deck shall be centered on supporting members, with typical lengths extending over two or more spans.

E. Unless otherwise indicated on the drawings, attachments shall secure the deck to the structure against a net uplift of at least 60 psf [3.0 kPa] along the roof perimeter for at least 10 feet [3.0 m] in from the exterior walls and at eave overhangs. In all other roof areas, deck attachments shall secure the deck to the structure against a net uplift of at least 30 psf [1.5 kPa].

2.02 MATERIALS.

A. Materials used in the manufacture and installation of steel roof deck shall be as follows.

Steel Deck	Hot-dip galvanized steel, ASTM A653, min Fy=33,000 psi [230 MPa]; prefabricated, side lap units, 1-1/2 inch [38 mm] deep, Type HSB-36, 20 gage [0.91 mm] minimum steel thickness; Verco Manufacturing Company.
Zinc Coating	ASTM A653, coating designation G60 galvanized deck.
Compressible Filler	Preformed soft rubber.

2.03 . ACCESSORIES.

A. All accessories, such as flashings and closure pieces and other items as indicated or required, shall be fabricated of the same material and finish as deck units, in the thicknesses indicated or recommended by the deck manufacturer. Sufficient screws and welding washers, if recommended by the manufacturer, shall be furnished to attach the decking as indicated on the drawings. Compressible closure pieces specifically designed to seal end openings and other gaps in the decking during erection shall be furnished.

2.04 SHOP COATING.

A. Materials shall be hot-dipped galvanized.

PART 3 EXECUTION

3.01 INSTALLATION.

A. Steel roof deck shall be installed in accordance with the recommendations of the Steel Deck Institute and shall be secured to the

supporting steel, including miscellaneous framing around openings and at side joints as follows.

3.02 AT SUPPORTING MEMBERS.

A. Unless otherwise indicated on the drawings, roof deck panels shall be secured to each supporting member with fusion welds at least 3/4 inch [19 mm] in diameter, at maximum 12 inch [300 mm] centers, in all roof areas except along the roof perimeter. Within a perimeter strip extending at least 10 feet [3.0 m] in from the roof edges, panels shall be secured to supporting members with fusion welds at least 3/4 inch [19 mm] in diameter at maximum effective spacing of 6 inches [150 mm]. Deck edges shall be secured to perimeter members parallel to the deck span at 6 inch [150 mm] centers with fusion welds at least 3/4 inch [19 mm] in diameter. Welds shall seal the metal completely, leaving no openings through the deck. Welds shall penetrate all layers of deck material at the point of welding and shall achieve complete fusion to the supporting member. Suitable welding washers shall be used, if welds satisfactory to the Engineer cannot be otherwise achieved.

B. All welding shall conform with ANSI/AWS D1.3 Structural Welding Code – Sheet Steel. **AT SIDE JOINTS**

A. Unless otherwise indicated on the drawings, roof deck panels shall be secured to each other at supporting members and between supports at intervals not to exceed 12 inches [305 mm] for sidelap fasteners with 1 ½" inch [38 mm] long seam welds made from the top side without burning through the deck.

3.04 FINISHING.

A. The installed roof deck shall be smooth, unbroken, and free of unnecessary openings, holes, or crevices which might allow leakage of adhesive or bitumen. Any such openings shall be repaired to the satisfaction of Engineer.

B. Field-cut openings for piping or other projections shall be neatly cut and adequately flashed. Openings larger than three ribs in width shall be supported by structural members or otherwise reinforced.

C. Unless otherwise indicated on the drawings, steel deck shall not be used to support ceilings, light fixtures, ducts or other utility devices.

D. Repairs to paint and galvanized materials. Factory finished surfaces damaged prior to acceptance by Owner shall be spot primed and recoated with materials equivalent to the original coatings. If, in the opinion of Engineer, spot repair of the damaged area is not satisfactory, the entire surface or item shall be recoated.

CLEANUP.

E. At the completion of installation, all surplus materials, rubbish, and other debris shall be removed from the surface of the roof deck.

END OF SECTION

SECTION 05550
ANCHORAGE IN CONCRETE AND MASONRY

PART 1 GENERAL

1.01 SCOPE.

A. This section covers the procurement and installation of anchors in concrete and masonry. It includes cast-in-place anchor bolts, adhesive anchors, expansion anchors, undercut anchors, and epoxy grouted anchor bolts and reinforcing bars to be installed in concrete and masonry.

1.02 GENERAL.

A. Unless otherwise specified or indicated on the drawings all anchors and anchor bolts shall be cast-in-place anchor bolts with forged heads or embedded nuts and washers. Unless otherwise indicated bolts in concrete shall have a diameter of at least 3/4 inch [19 mm], and bolts in grouted masonry shall have a diameter of at least 1/2 inch [12.7 mm].

B. Unless otherwise indicated on the drawings, anchors and anchor bolts used in the following locations and applications shall be of the indicated materials. Other anchors and anchor bolts shall be as indicated on the drawings.

Cast-In-Place Anchor Bolts.

Submerged locations	Stainless steel.

Locations subject to splashing	Stainless steel.
Buried locations	Stainless steel.
Anchorage of structural steel columns	Stainless steel.
Other exterior locations	Stainless steel.
Other interior locations	Carbon steel.

Adhesive, Expansion, and Undercut Anchors.

Submerged locations	Stainless steel.

Locations subject to splashing	Stainless steel.
Buried locations	Stainless steel.
Anchorage of structural steel columns	Stainless steel.
Other exterior locations	Stainless steel.
Other interior locations	Carbon steel.

C. Adhesive, expansion, and undercut anchors may not be substituted in lieu of cast-in-place anchors unless written permission is obtained from engineer.

1.03 . SUBMITTALS.

A. Data and catalog cuts indicating the manufacturer and types of adhesive anchors, expansion anchors, undercut anchors, and epoxy grouts to be supplied shall be submitted in accordance with the Submittals section.

1.04 DELIVERY, STORAGE, AND HANDLING.

A. Materials shall be handled, transported, and delivered in a manner which will prevent damage or corrosion. Damaged materials shall be promptly replaced. Materials shall be shipped and stored in original manufacturer's packaging.

PART 2 PRODUCTS

2.01 2-1. MATERIALS.

A. Materials shall be as indicated below.

Anchor Bolts.

Carbon steel	ASTM F1554, Grade 36 with compatible nuts.
Stainless steel	Bolts, ASTM F593, Alloy Group 2 (316); nuts, ASTM F594, Alloy Group 2 (316).
Flat Washers	ANSI B18.22.1; of the same material as anchor bolts and nuts.
Reinforcing Bars	ASTM A615, Grade 60, deformed.

Reinforcing Bars, weldable	ASTM A706, Grade 60, deformed.
Adhesive for Anchoring Reinforcing Bars.	
Adhesive	
For Floors and Horizontal Surfaces	Hilti "HIT HY 200 MAX" for concrete.
For Vertical Surfaces and Overhead Applications	Hilti "HIT HY 200 MAX" for concrete.
Expansion Anchors	Hilti "KWIK-BOLT TZ"
Adhesive Anchors for Concrete.	
Threaded Rods and Nuts	As specified for Anchor Bolts and as recommended by the adhesive manufacturer.
Adhesive	Hilti "HIT HY 200 MAX" for concrete,

2.02 ANCHORS.

A. Cast-in-Place Anchor Bolts. Cast-in-place anchor bolts shall be delivered in time to permit setting before the structural concrete is placed. Unless installed in pipe sleeves, anchor bolts shall be provided with sufficient threads to permit a nut to be installed on the concrete side of the concrete form or the supporting template. Two nuts, a jam nut, and a washer shall be furnished for cast-in-place anchor bolts indicated on the drawings to have locknuts; two nuts and a washer shall be furnished for cast-in-place anchor bolts without locknuts.

B. Adhesive and Expansion Anchors. When adhesive or expansion anchors are indicated on the drawings, only acceptable systems shall be used. Acceptable systems shall include only those systems and products specified or specifically indicated by product name on the drawings. Alternative anchoring systems may be used only when specifically accepted by Engineer.
Unless otherwise required, single nut and washer shall be furnished for adhesive anchors and expansion anchors. Adhesive anchors shall be free of coatings that would weaken the bond with the adhesive.

PART 3 EXECUTION

3.01 GENERAL.

A. Anti-seize thread lubricant shall be liberally applied to projecting, threaded portions of stainless steel anchors immediately before tightening of the nuts.

3.02 CAST-IN-PLACE ANCHOR BOLTS.

A. Cast-in-place anchor bolts shall be carefully positioned with templates and secured in the forms prior to placing concrete. Contractor shall verify that anchorage devices are positioned in accordance with the design drawings and with applicable equipment submittal drawings. Bolts shall be positioned sufficiently in advance of the concrete placement so that an on-site representative of Engineer or Owner will have sufficient time to inspect the bolts prior to placing concrete. Special Inspection of anchor bolts is required by the local building code. Anchorage shall be placed in sufficient time and with sufficient notification so that such inspection can take place without delaying progress of the work.

B. Threads, bolts, and nuts spattered with concrete during placement shall be cleaned prior to final installation of the bolts and nuts.

3.03 ADHESIVE ANCHORS.

A. The embedment depth for adhesive anchors shall be as indicated by the manufacturer unless otherwise indicated on the drawings.

B. Adhesive for adhesive anchors shall be statically mixed in the field during application. All proportioning and mixing of the components shall be in accordance with the manufacturer's recommendations.

C. Anchors shall be installed in holes drilled into hardened concrete or grout filled masonry. Diameter of holes shall be 1/16 inch [1.5 mm] larger than the outside diameter of the rod unless recommended otherwise by the anchor system manufacturer. Holes shall be prepared for insertion of the anchors by removing all dust and debris using procedures recommended by the adhesive manufacturer.

D. Adhesive anchors and holes shall be clean, dry, and free of grease and other foreign matter at the time of installation. The adhesive shall be placed and the rods shall be set in accordance with the recommendations of the material manufacturer. Care shall be taken to ensure that all spaces and cavities are filled with adhesive, without voids.

3.04 EXPANSION ANCHORS.

A. Expansion anchors shall be installed in accordance with the drawings, but in no case shall the embedment depth be less than as indicated by the manufacturer. The minimum distance between the center of any anchor and an edge or exterior corner of concrete shall be as indicated on the drawings but not less than manufacturer's specifications. Unless otherwise indicated on the drawings, the minimum distance between the centers of anchors shall be as indicated by the manufacturer.

END OF SECTION

SECTION 05990
STRUCTURAL AND MISCELLANEOUS METALS

PART 1 GENERAL

1.01 SCOPE.

A. This section covers the fabrication and erection of structural and miscellaneous metal items not covered in other sections.

B. Except as otherwise specified or indicated on the drawings, all work shall conform to the applicable provisions of the AISC "Manual of Steel Construction - Allowable Stress Design", Parts 1, 2, 3, and 4, the AISC "Specification for Structural Steel Buildings" and the Aluminum Association "Specifications for Aluminum Structures".

C. Special Inspection shall be provided by the Contractor as indicated on the drawings.

D. Both inch-pound (English) and SI (metric) units of measurement are specified herein; the values expressed in inch-pound units shall govern.

1.02 SUBMITTALS.

A. Complete data, fabrication drawings, and setting or erection drawings covering all structural and miscellaneous metal items shall be submitted in accordance with the submittals section.

B. All bolted connections and welds shall be properly identified on the shop drawings. Welding procedures, welding procedure qualification records and welder qualifications shall be submitted.

C. Contractor shall provide welder certifications for review and approval.

D. Submittals for high strength bolts, tension control bolts and load indicator washers shall include statements from the bolt and washer manufacturers certifying satisfactory compliance with the governing standards and the specified tests.

1.03 DELIVERY, STORAGE, AND HANDLING.

A. Materials shall be handled, transported, and delivered in a manner which will prevent bends, dents, significant coating damage, or corrosion. Damaged materials shall be promptly replaced. Structural and miscellaneous metal work shall be stored on blocking so that no metal touches the ground and water cannot collect thereon. The material shall be protected against bending under its own weight or superimposed loads.

B. Bolting materials shall be stored indoors. Weld rod shall be stored in accordance with the supplier's instructions and AWS D1.1.

1.04 PLANT CERTIFICATION

A. All fabricating plants providing structural steel shall be category STD certified in accordance with the AISC Quality Certification Program.

1.05 QUALITY ASSURANCE.

A. All weld procedures and welder qualification shall be available in the Contractor's field office for Engineer's review.

B. All welding shall be inspected by an Owner-provided inspector qualified in accordance with AWS requirements and approved by the Engineer.

C. Inspection: All Work hereunder shall be subject to continuous inspection by a Special Inspector approved by City. Special Inspection shall be performed in accordance with the current edition of the California Building Code.

D. The Special Inspector shall observe the work as identified on the plans for conformance with the design drawings and specifications.

PART 2 PRODUCTS

2.01 GENERAL.

A. All structural steel shall be detailed and fabricated to facilitate compliance with OSHA 29 CFR Part 1926 subpart R and all other pertinent OSHA and local safety regulations.

B. All field connection materials shall be furnished.

2.02 MATERIALS.

Steel

Shapes (W, WT)	ASTM A992
Shapes (S, M, HP, C)	ASTM A36 or ASTM A572 Grade 50.
Other Shapes (angles)	ASTM A36
Plates and Bars	ASTM A36.
Sheets	ASTM A1008 CS Type B or A1011 CS Type B.

Pipe	ASTM A53, Type E or S, Grade B; ASTM A500, Grade B.
Square and Rectangular Structural Tubing	ASTM A500, Grade B.
Checkered Plate	ASTM A786, carbon steel, skid resistant pattern as standard with the manufacturer; Inland "4-way Floor Plate" or U.S. Steel "Multigrip Floor Plate".
Bolts and Nuts	
Bolts, High Strength	ASTM A325, Type 1; tested in accordance with Article 9.2 thereof.
Bolts, unfinished	ASTM A307.
Nuts, Heavy-Hex	ASTM A563, grade and finish compatible with bolts.
Nuts, Self-Locking	Prevailing torque type; IFI-100, Grade A.
Washers	
Flat, Hardened	ASTM F436, Type 1.
Lock	ANSI/ASME B18.21.1, helical spring type.
Beveled	ASTM F436.
Anchor Bolts	ASTM F1554, Grade 36
Threaded Rods	ASTM A36

Stainless Steel

Shapes	ASTM A276, Type 316L.
Plates	ASTM A240, Type 316L.
Pipe	ASTM A312, Grade TP316L

Tube	ASTM A269, Grade TP316L
Checkered Plate	ASTM A793, stainless steel, raised pattern A
Bolts	ASTM F593, Alloy Group 1 or 2
Nuts	ASTM F594, Alloy Group 1 or 2
Washers	
Flat	ANSI/ASME B18.22.1, Type 316.
Lock	ANSI/ASME B18.21.1, helical spring type, Type 316.
Cast Iron	ASTM A48, Class 35B or better.
Aluminum	
Sheet and Plate	ASTM B209, Alloy 6061-T6.
Rolled Sections	ASTM B308, Alloy 6061-T6. All members shall be Aluminum Association standard shapes.
Rod and Bar (Rolled or Drawn)	ASTM B211, Alloy 6061-T6 or 2017-T4.
Extrusions	ASTM B221, Alloy 6063-T5 or T6.
Pipe	ASTM B429, Alloy 6061-T6.
Rivets	ASTM B316, Alloy 6061-T6.
Bolts, Aluminum	ASTM F468, Alloy 2024-T4.
Nuts, Aluminum	ASTM F467, Alloy 6061-T6.
Washers, Aluminum	
Flat	ANSI/ASME B18.22.1, Type 6061 T-6.
Lock	ANSI/ASME B18.21.1, helical spring type, Type 6061-T6.
Castings	ASTM B26 or B85.
Checkered Plate	ASTM B632, Type 6061-T6.
Brass or Bronze	

Plate and Strip	ASTM B36.
Casting	ASTM B61 or B584
Bolts and Nuts	IFI-104, Grade 462 or 464.
Washers	
Flat	ANSI/ASME B18.22.1
Lock	ANSI/ASME B18.21.1, helical spring type.
Silicon Bronze	
Sheet and Plate	ASTM B96, American Brass "Everdur 1010".
Castings	ASTM B584, American Brass "Everdur 1000".
Bolts and Nuts	IFI-104, Grade 655.
Washers	
Flat	ANSI B18.22.1.
Lock	ANSI/ASME B18.21.1, helical spring type.
Weld Metal (Steel Connections)	ANSI/AWS D1.1, Table 3.1, filler metal with minimum 70 ksi [482 MPa] tensile strength unless otherwise required.
Welded Headed Studs, Concrete Anchors, and Shear Connectors	ASTM A108 with a minimum 50,000 psi [344 MPa] yield strength and minimum 60,000 psi [413 MPa] tensile strength. TRW/Nelson or equal.
Deformed Bar Anchors (DBA)	ASTM A496 with a minimum 70,000 psi [482 MPa] yield strength and minimum 80,000 psi [551 MPa] tensile strength. TRW/Nelson division or equal.
Bird Screen	2 mesh [12 mm square openings], brass or copper wire cloth, min wire dia 0.063 inch [1.6 mm].

Body Solder	Flux-core wire, ASTM B32, Alloy Grade 20B.
Shop Coatings	
Universal Primer	As indicated in protective coatings section.
Epoxy Enamel	As indicated in protective coatings section.
Galvanizing	ASTM A123, A153, A385.

2.03 FABRICATIONS.

A. The following fabrications shall be constructed as indicated on the drawings and as specified herein.

1. Checkered Floor Plates. Checkered floor plates shall be painted steel unless specifically designated on the drawings as galvanized steel, stainless steel or aluminum. Shop welded stiffeners or grating backup shall be provided as indicated on the drawings. Stiffeners and grating backup shall be of the same material as the checkered plate.

   Checkered floor plates shall be detailed and fabricated in sections which can be lifted by one or two men. Plates which are not required to be bolted or welded in place shall be provided with lifting holes to facilitate removal. Warped or bent plates shall be straightened so they will lie perfectly flat.

   Checkered floor plates shall be secured to structural shapes or grating using 3/8 inch [9 mm] stainless steel slotted flathead machine screws at 12 inch [300 mm] centers, Lindapter "Floor-Fast" stepped locking fasteners or as indicated on the drawings. Connection devices shall not protrude above the plate surface.

   Access holes shall be provided in the plate if required to allow access to grating hold-down devices beneath the plate.

2.04 SHOP COATING.

A. All structural and miscellaneous metal items shall be shop coated as specified herein. The requirements for field painting are covered in the protective coatings section.

1. Cleaning. Surfaces shall be dry and of proper temperature when coated, and shall be free of grease, oil, dirt, dust, grit, rust, loose mill scale, weld flux, slag, weld spatter, and other objectionable substances. Articles to be galvanized shall be pickled before galvanizing. All other ferrous metal surfaces shall be cleaned by solvent, high-speed power wire brushing or by blasting to the extent recommended by the paint manufacturer and as required in the protective coatings section. All other ferrous metal surfaces shall be cleaned by SSPC-SP10 unless otherwise specified.

2. Edge Grinding. Sharp projections of cut or sheared edges of ferrous metals which will be submerged in operation, except for items specified to be hot-dip galvanized, shall be ground to a radius as needed to ensure satisfactory paint adherence and as required in the protective coatings section.

3. Prime Painted Steel. Unless otherwise specified or indicated on the drawings, all ungalvanized structural and miscellaneous steel shall be given a universal prime coat in the shop after fabrication. The dry film thickness of the universal primer shall be at least 5 mils [125 µm]. Steel surfaces shall be prime-coated as soon as practicable after cleaning. Steel shall not be moved or handled until the shop coat is dry and hard.

4. Galvanizing. Steel materials required to be galvanized are indicated on the drawings. All galvanizing shall be done by the hot-dip process after fabrication. An approved zinc-rich paint shall be used to touch up minor coating damage. Materials with significant coating damage shall be regalvanized or replaced. Where galvanized bolts are indicated on the drawings or specified, the use of zinc-plated bolts will not be acceptable.

5. Stainless Steel. Unless otherwise specified, all items fabricated from stainless steel shall be thoroughly cleaned and degreased after fabrication. Pickling or a light blast cleaning shall produce a modest etch and remove all embedded iron and heat tint. Surfaces shall be subjected to a 24 hour water test or a ferroxyl test to detect the presence of residual embedded iron and shall be retreated as needed to remove all traces of iron contamination. Surfaces shall be adequately protected during shipping and handling to prevent contact with iron or steel objects or surfaces.

6. Aluminum. All surfaces of aluminum which will be in contact with concrete, mortar, or dissimilar metals shall be given a coat of epoxy enamel.

7. Castings. Shop coating of miscellaneous iron castings will not be required.

8. Other Surfaces. Painting of zinc coated steel or bronze surfaces will not be required.

PART 3 EXECUTION

3.01 STRUCTURAL STEEL ERECTION.

A. Structural steel shall be erected so that individual pieces are plumb, level, and aligned within a tolerance of 1:500. The elevations of the top of floor and roof members shall be within 1/16 inch [1.5 mm] of the elevations indicated on the drawings. The faces of girts and other supporting members for rigid wall panels shall be in vertical planes within a maximum variation of 1/8 inch [3 mm].

B. All members and parts, as erected, shall be free of warps, local deformations, and unauthorized bends. All parts shall be assembled accurately as indicated on the drawings. Light drifting will be permitted to draw parts together, but drifting to match unfair holes will not be permitted. Any enlargement of holes necessary to make connections in the field shall be done by reaming with twist drills and only with the approval of Engineer. Enlarging holes by burning will not be permitted.

C. Baseplates shall be set level in exact position and grouted in place.

D. All materials shall be erected in compliance with OSHA 29 CFR, Part 1926, Subpart R, and with all other applicable OSHA and local safety regulations.

1. Inspection and Testing. When the quality control section indicates that special inspections are required, such inspections shall be performed for field fabrication and erection of structural and miscellaneous metals, and for all structural steel field connections. The erector shall provide access as needed to facilitate all inspections and shall provide timely notification during erection when inspection milestones are approaching. As stipulated in Specification Section 01400, "Quality Requirements", special tests and inspections required during the progress of work will be made at the expense of Contractor.

2. STRUCTURAL STEEL CONNECTIONS. Unless otherwise indicated on the drawings, bolted connections for structural steel, as defined in the AISC manual, shall be made with ASTM A325 high strength bolts conforming to the "Specification for Structural Joints Using ASTM A325 or A490 Bolts" as approved by the Research Council on Structural Connections. The method of installation, pretensioning procedures, bolting equipment and tools shall likewise conform to the above referenced standard.

Except as otherwise indicated on the drawings or specified herein, bolted connections shall be bearing type with threads included in the shear plane.

Bolts in all structural steel connections shall be fully pretensioned in accordance with the AISC standards unless specifically noted otherwise on the drawings. The turn-of-the-nut method shall be used to verify pretensioning of bolts in bearing type connections. When using turn-of-the-nut method the bolt, nut, and material shall be match marked. A wax lumber marker or paint shall be used to clearly mark the assembly. The calibrated wrench method of pretensioning bolts will not be permitted.

Bolt holes shall have a diameter nominally 1/16 inch [1.5 mm] larger than the nominal bolt diameter. Bolt holes for one ply of vertical diagonal bracing connections may be oversized to a diameter nominally 3/16 inch [5 mm] larger than the nominal bolt diameter. If oversized holes are provided in an outer ply, a hardened flat washer shall be installed over each hole during bolting.

Contact surfaces of bearing type connections may be shop coated. When assembled, all joint surfaces, including those adjacent to the bolt heads, nuts, or washers, shall be free of loose mill scale, dirt, burrs, oil, and other foreign material that would prevent solid seating of the parts.

Beveled washers shall be used when the bearing faces of bolted parts have a slope of 1:20 or greater with respect to a plane perpendicular to the bolt axis. Bolt length shall be increased as needed to accommodate the beveled washers.

Bolts, nuts, and washers shall be galvanized when connected materials are galvanized or where indicated on the drawings.

3. MISCELLANEOUS STEEL CONNECTIONS. Connections for miscellaneous steel fabrications not included in the AISC definition of structural steel may be made with unfinished bolts unless indicated otherwise on the drawings. Unless otherwise indicated on the drawings all unfinished bolts shall be snug tight.

4. STRUCTURAL AND MISCELLANEOUS STEEL WELDING. Welding and related operations shall conform to applicable provisions of the Structural Welding Code - Steel, AWS D1.1, of the American Welding Society. All welding shall be performed in accordance with written procedures, using only those joint details which have prequalified status when performed in accordance with AWS D1.1. All welding shall be performed by welders qualified in accordance with the American Welding Society for

steel welding and American Society for Mechanical Engineers Section IX for stainless steel welding.

All welds shall be visually inspected in accordance with AWS procedures.

Welds not dimensioned on the drawings shall be sized to develop the full strength of the least strength component of the connection.

Where structural or miscellaneous steel connections are welded, all butt and miter welds shall be continuous and, where exposed to view, shall be ground smooth. Intermittent welds shall have an effective length of at least 2 inches [50 mm] and shall be spaced not more than 6 inches [150 mm] apart.

Surfaces to be welded and surfaces within 2 inches [50 mm] of a weld shall be free from loose or thick scale, slag, rust, moisture, grease, paint and other foreign materials that would prevent proper welding or release objectionable fumes.
Only shielded metal arc, gas metal arc, flux cored arc, submerged arc, and gas tungsten arc welding are permitted. For flux cored arc welding, only E70xx one (1) or five (5) wire electrodes with supplemental gas shielding shall be permitted. Use of electroslag or electrogas welding processes or the short-circuiting transfer mode of the gas metal arc process will not be acceptable.

Field welded connections shall not be substituted for field bolted connections indicated on the drawings.

Deformed bar anchors, headed studs, concrete anchors and shear connectors shall be welded with an automatic stud welding gun per the manufacturer's recommendation. Hand welding will not be acceptable.

3.02 STRUCTURAL AND MISCELLANEOUS ALUMINUM.

A. Unless otherwise noted, all work shall conform to applicable provisions of the Aluminum Association "Standard for Aluminum Structures".

1. Connections. Connections not specifically detailed on the drawings shall develop the full strength of the least strength member of the connections. Bolted connections shall be all-bolted bearing type, equipped with a helical spring lock washer under the stationary element (bolt head or nut) and a flat washer under the turned element. All bolts shall be fully tightened. Bolts and nuts for structural aluminum connections shall be stainless steel. Bolts and nuts for nonstructural miscellaneous aluminum assemblies shall be stainless steel or aluminum. A sufficient number of bolts

shall be provided in each connection to develop the shear strength of the member.

Welded connections shall be made in accordance with the American Welding Society D1.2, Structural Welding Code - Aluminum. All welding shall be performed by welders qualified in accordance with American Welding Society. Welds shall be free of porosity, cracks, holes, and flux. Welded connections shall not be substituted for bolted connections without prior approval of Engineer.

2. Erection. Structural aluminum shall be erected so that individual pieces are plumb, level, and aligned within a tolerance of 1:500. The elevation of horizontal members shall be within 1/16 inch [1.5 mm] of the elevation indicated on the drawings.

Baseplates shall be set level in exact position and grouted in place.

END OF SECTION

SECTION 06100
ROUGH CARPENTRY

PART 1 GENERAL

1.01 SCOPE.

A. This section covers miscellaneous items indicated on the Drawings to be of wood construction. Rough carpentry shall include the following:

1. Wood nailers and blocking.

2. Miscellaneous wood framing.

3. Rough hardware and fasteners.

4. Project sign.

1.02 SUBMITTALS.

A. Drawings and data for rough carpentry and field fabricated items will not be required.

1.03 PROTECTION AND STORAGE.

A. Lumber shall be protected and kept under cover, both in transit and at jobsite. Lumber shall be carefully stacked on suitable supports in a manner which will ensure proper ventilation and drainage.

B. All lumber shall be delivered to the jobsite bearing grade stamps of the Western Wood Products Association or Southern Pine Inspection Bureau. All lumber shall be segregated by grades. Extreme care shall be exercised in unloading the lumber to prevent damage, splitting, or breaking of materials.

C. All plywood shall be identified according to species, grade, and glue type by the stamp of the American Plywood Association.

PART 2 PRODUCTS

2.01 MATERIALS.

Lumber	American Standard Lumber conforming to PS20, moisture content 15 percent or less; sized dry.
Pressure Treated Plywood	Douglas fir-larch, pressure treated with waterborne preservative in accordance with AWPA U1 (Use Category IC2 for interior

	construction; Use Category UC3b for exterior construction).
Roof Sheathing	¾" APA rated sheathing, 32/16, PS-1, Exterior grade, APA series V-611 (per Drawings)
Bolts and Nuts	ASTM A307; galvanized, ASTM A153; or zinc-plated, ASTM B633, SC-4 (per Drawings).
Wood Screws	Galvanized steel, 18-8 stainless steel (per Drawings).
Nails	Galvanized or aluminum coated (per Drawings).
Rough Hardware	Galvanized steel, 18-8 stainless steel (per Drawings).

2.02 ROUGH CARPENTRY.

A. Rough carpentry shall include lumber work generally, except finish work.

B. The Contractor shall install all wood framing, blocking, and nailers as indicated on the Drawings or required to complete a finished building. In addition to all framing indicated on the Drawings, nailers, blocking, and other backing required for other work and trades shall be installed.

C. At all times during execution of this portion of the contract, sufficient workmen and supervisors shall be present who are thoroughly familiar with rough carpentry construction and the materials and techniques specified or indicated on the Drawings.

D. All rough carpentry shall produce joints true, tight, and well nailed, with all members assembled in accordance with the Drawings and with all pertinent codes and regulations.

E. Individual pieces of lumber shall be selected so that obvious defects will not interfere with the placement of bolts, proper nailing or making of joints. All pieces with defects which render them unusable shall be discarded. Individual pieces of lumber which are too small to use in fabricating the work with minimum joints shall be discarded.

F. Whether or not lumber has been installed, it may be rejected by the Engineer for excessive splits, warp, twist, bow, crook, mildew, or fungus, as well as for improper cutting and fitting.

PART 3 EXECUTION

3.01 INSTALLATION.

A. Rough Carpentry. Carpentry work shall be set to required levels and lines, with members plumb and true.

1. Carpentry shall be securely attached to substrates by anchoring and fastening as indicated and as required for strength and by recognized standards.

2. Framing members shall not be bored or cut for pipes, ducts, conduits, or for any other reasons except where accepted by the Engineer.

3. The premises shall be kept in a neat, safe, and orderly condition at all times during the execution of this portion of the work and shall be free from accumulation of sawdust, cut ends, and other debris.

4. Connections between members shall be tight. Washers shall be provided under all bolt heads and nuts in contact with lumber. Installation of fasteners shall not cause splitting of wood.

5. Structural lumber in exterior locations; lumber in contact with concrete, masonry, earth, or water; and all wood nailers shall be pressure treated unless otherwise specified.

B. Nailers. Nailers shall be provided where indicated on the Drawings or as required to complete a finished building. The nailers shall be continuous and shall be installed level and straight. Each section of nailer shall be secured by at least two anchor bolts.

END OF SECTION

SECTION 07160
DAMPPROOFING

PART 1 GENERAL

1.01 SCOPE.

A. This section covers furnishing and installation of dampproofing for concrete.

B. Dampproofing of concrete surfaces exposed to water in potable distribution, or pumping facilities, shall be with NSF certified epoxy enamel, and shall be in accordance with Specification Section 09900, "Painting and Coating".

PART 2 PRODUCTS

2.01 MATERIALS.

A. Materials to be used shall be as follows:

Medium Consistency Coal Tar	Carboline "Bitumastic 50", Polyguard "CA-14 Coating", or Tnemec "46-465 H. B. Tnemecol".
Membrane	Grace "Bituthene 3000" and "Bituthene Low Temperature".

B. Membrane shall be a self-adhesive rubberized asphalt/polyethylene waterproofing material with a minimum thickness of 1/16 inch (1.5 mm).

2.02 SURFACES TO BE DAMPPROOFED.

A. Exterior wall surfaces which are poured against sheeting or undisturbed earth need not be dampproofed. The following concrete surfaces that are not in contact with treated or potable water shall be dampproofed:

a. All exterior concrete wall surfaces forming a part of an interior room or dry pit which will be in contact with earth backfill below finished grade and above the top of the footings or bottom slabs.

b. All exterior wall surfaces of cast-in-place and precast concrete manholes, handholes, and vaults below finished grade and above the top of the footings or bottom slabs. This includes all electrical manholes and handholes. This includes the underside of all precast units.

c. All walls in contact with liquid where the opposite face is above grade or exposed in an interior room, except when waterproofing is specified.

PART 3 EXECUTION

3.01 SURFACE PREPARATION.

A. When dampproofing is applied, concrete surfaces shall be clean and dry. All dirt, dust, sand, grit, mud, oil, grease, and other foreign matter shall be removed in accordance with ASTM D4258 and the surface abraded when recommended by the manufacturer of the dampproofing material. Abrading shall be done in accordance with ASTM D4259. Prior to application of the coating, the surfaces shall be thoroughly washed, or cleaned by air blasting, to remove all dust and residue.

3.02 APPLICATION.

A. Dampproofing materials shall not be thinned unless recommended by the manufacturer. Dampproofing using medium consistency coal tar shall be applied in at least two coats, with a total dry film thickness of at least 20 mils [510 µm].

B. Surfaces not intended to be dampproofed shall be protected from contamination, discoloration, or other damage. Such surfaces shall be masked as necessary to protect uncoated areas and to confine the dampproofing to the intended limits.

C. Surfaces shall be dry and at recommended temperature when dampproofing is applied. Unless properly protected, coatings shall not be applied in wet, damp, or foggy weather or when windblown dust, dirt, or debris, or insects would collect on the coating. Dampproofing shall not be applied when the temperature of the air or the surface is below 40°F [4°C].

D. Dampproofing shall be applied by brush, high pile rollers, or spray equipment complying with the manufacturer's recommendations. If blistering occurs, all blisters larger than 1/4 inch [6 mm] in diameter shall be broken before the subsequent coat is applied.

E. Membrane shall be installed in accordance with manufacturer's recommendations including the recommended primer.

END OF SECTION

SECTION 07321
LIGHTWEIGHT COMPOSITE ROOF TILE

PART 1 - GENERAL

1.01 SCOPE.

A. This section covers the furnishing and installing of a composite tile roofing system complete with adhesives, fasteners, flashings, underlayments and self-seal membrane, and accessories.

1.02 GENERAL.

A. Except as otherwise indicated on the drawings, all roof decks shall be covered with insulated, fully adhered composite tile roofing system as indicated. The finished roof shall be watertight under all conditions of weather and service except physical damage due to unforeseen causes.

B. The roof system shall meet UL rating Class A and wind uplift FM classification 1-120.

C. Unless indicated otherwise, a complete total system warranty covering all elements of the roofing system shall be furnished with this work. A warranty which covers only the membrane will not be acceptable.

1.03 SUBMITTALS.

A. Complete specifications and data covering the roofing systems and materials furnished under this section shall be submitted in accordance with the Submittals section.

B. Drawings shall be submitted showing outline of roof area and roof size, locations and types of roof penetrations, perimeter and penetration details, splice details, special details as needed, and installation instructions.

C. Drawings shall be submitted showing the insulation manufacturer's recommended layout for each area of tapered insulation and crickets, when such systems are indicated on the drawings.

D. Samples of the roofing membrane, insulation, and fasteners shall be submitted. Test data for pullout resistance for fastening systems shall be provided.

E. Data shall be submitted showing compliance with UL requirements for the Class rating and the Factory Mutual wind uplift classification as indicated.

F. Evidence shall be submitted which shows the roofing system installer to be an authorized applicator of the system furnished.

1.04 SUBCONTRACTOR'S QUALIFICATIONS.

A. Unless indicated otherwise on the drawings, work under this section shall be done by a qualified roofing subcontractor who has experience with the roofing system specified. The roofing subcontractor shall be currently operating under the franchise of the roofing membrane manufacturer. The work shall be inspected by a representative of the membrane manufacturer to verify that materials and methods of application are in accordance with the recommendations of the manufacturer and with these specifications.

1.05 DELIVERY, STORAGE, AND HANDLING.

A. Shipping shall be in accordance with the Shipping section. Handling and storage shall be in accordance with the Handling and Storage section.

B. Materials shall be delivered in original, unopened containers labeled with the manufacturer's name, brand name, installation instructions, and identification of various items. All materials for the roofing system shall be stored and handled in accordance with the recommendations of the manufacturer.

1.06 WARRANTY.

A. Unless otherwise indicated, the manufacturer of the roofing membrane shall furnish to City, through the roofing subcontractor, a nonprorated, no dollar limit, total roof system warranty covering the workmanship and application of the roofing system including membranes, insulation, fasteners, and flashings for a period of 15 years from the date of acceptance.

B. The warranty shall provide for the repair of the total roofing system including repairs to membrane, flashings, counterflashings, insulation, barrier and cover boards, if required, fasteners, adhesives and sealants resulting from all leaks in the membrane and base flashings that may occur due to defective materials, improper workmanship, and normal weather conditions. Unless otherwise indicated, the warranty shall include general wind uplift protection to 90 mph [145 km/hr] peak gusts.

C. In addition, the manufacturer shall also provide a separate material warranty covering the membrane for not less than 20 years against premature deterioration because of weathering.

PART 2 PRODUCTS

2.01 MATERIALS.

A. Unless noted otherwise, all materials used in construction of the roof system shall be furnished by the same manufacturer. Materials shall be manufactured by firms of national reputation.

B. In order to indicate type, quality, and features required, this specification is based on Quarrix Building Products, "Double Roman Lightweight Composite Tile". Equivalent roofing systems manufactured by other manufacturers may also be acceptable provided the requirements of these specifications are met.

Materials shall conform to the following:

Size	16-1/2 inches long by 13 inches wide
Exposure Per Tile	13-1/2 inches wide by 11-9/16 inches long
Weight	3.3 lb; 303.6 lbs weight/square
Color	Selected from manufacturer's available colors.
Trim	Supply manufactured shapes of same material, style, color and texture as roof tile for indicated hips, ridges and rakes.
Underlayment	Asphalt saturated organic felt: No. 30 asphalt saturated organic felt, to meet requirements of ASTM D-226, Type 2 or equal.
Eave Flashings and Other Metal Flashings	24 gauge galvanized steel sheet, ASTM a 653/A 653M, minimum G90/Z275 hot-dip zinc coating.
Concealed Sealants	Along gable rakes, ridge/hip trim and flashings with asphalt saturated felt underlayment shall be non-running, heavy body Plastic Roof Cement that meets or exceeds the requirements of ASTM D 2822 and Federal Specifications SS-S-153C (Type 1).

Exposed Sealant	High quality sealant to meet or exceed requirements of U.S. TT-S-00230C, U.S. Fed Cat. No 8030-965-2397.
Ridge Vent	Manufacturer's standard.
Batten Strips	Softwood pressure, preservative treated.
Flow Thru Battens	Roofing manufacturer's standard.
Fasteners for Battens	Roofing manufacturer's standard.
Fasteners for Underlayment	11 gauge, 3/8 inch dia. head by 7/8 inch long ring-shank roofing nails of galvanized steel.
Fasteners for Field Tile	Manufacturer's standard.

Fasteners for Cut Tile	All cut pieces without factory fastener holes shall be attached to a larger piece or full tile with an approved adhesive or concealed 3/4 inch (19 mm) #12 sheet metal screws.
Fasteners for Hip/Ridge	2-1/2 inch (63.5 mm) non-corrosive #10, coarse thread, .344 inch (8.7 mm) diameter bugle head screws or 3 inch (76 mm) non-corrosive ring shank nail in combination with an approved adhesive under the nose of each trim piece.
Mortar/Grout	For hips, open valley sand saddles, provide a combination of 50 lb mix of "Quickwall Surface Bonding Cement" and 120 lb "Mason Mix" to meet or exceed strength requirements of ASTM C-387 for Type "N" mortar and "Concrete Acrylic Fortifier" to meet or exceed ASTM C-887 standard specifications as manufactured by Quikrete, Atlanta, GA. Grout and colored oxide to match field tile available from the Manufacturer
Adhesives	To secure cut pieces of field tile along hips, valleys, flying gables, and protrusions and to install hip/ridge/rake trim shall be Titebond as manufactured by Franklin International, Columbus, OH; RT-600 as manufactured by Ohio Sealant Inc., Mentor, OH, or 3500 Roof Tile Adhesive/Sealant by Geocel, Elkhart, IN, or equal.

PART 3 EXECUTION

3.01 INSPECTION.

A. The roofing membrane manufacturer's representative and the roofing subcontractor shall conduct all required inspections and shall submit to the roofing manufacturer all required drawings, details, and completed questionnaires for obtaining the specified warranty.

3.02 PREPARATION OF ROOF SURFACES.

A. Roof surfaces shall be cleaned and inspected before any roofing materials are applied. All drainage fixtures shall be set at the proper elevation to permit free flow of water.

B. The roof surfaces to be covered shall be smooth, hard, dry, and free from high spots, depressions, and frost or effects of frost. Roof surfaces shall be swept clean and free from dust, loosened cement scale, and debris. Roof surfaces shall be examined for openings, holes, or crevices which might allow adhesives or sealants to drip or flow through the deck or between the deck and vertical projections. Such openings shall be filled or covered before any roofing materials are applied.

3.03 APPLICATION OF ROOFING

1. System.

1. Install roof tile in accordance with shop drawings, manufacturer's printed installation instructions for specified project conditions and the following:

   a) ICC-ES -AC07.

   b) NRCA Steep Slope Roofing Manual.

   c) SMACNA Architectural Sheet Metal Manual.

2. Eave Flashings: Install metal eave flashing 1/8 inch (3 mm) beyond the fascia; lap end joints minimum 3 inches (76 mm), with plastic cement seal between overlapping metal surfaces.

   a) Apply self seal membrane over eave flashing parallel to eave edge in accordance with manufacturer's printed instructions.

   b) Extend self seal membrane up roof slope minimum 2 feet (610 mm) beyond interior face of exterior wall or as required by code, whichever is greater.

   c) Place each successive ply overlapping top edge of previous ply 3 inches (76 mm).

3. Valley Flashings: Install 24 inch (610 mm) to 28 inch (711 mm) standing seam, double rib (for closed valleys) or 24 inch (610 mm) double rib valley flashing (for open grouted valleys).

   a) Form flashings in accordance with manufacturer's instructions for valley type indicated.

b) Apply flashing over 36 inch (914 mm) full width vertical underlayment centered in all valley areas.

c) Install flashings centered on valley; nail in place at 12 inches (305 mm) on center, 1 inch (25 mm) from metal edges.

d) Roof Pitch 4 in 12 or Greater: Lap flashing end joints minimum 4 inches (102 mm).

e) Roof Pitch Less Than 4 in 12: Lap flashing end joints minimum 6 inches (152 mm).

f) For slopes below 3:12 or 4:12 in severe weather areas, install flashings and EPDM underlayment per details provided by the Manufacturer.

4. No.30 Underlayment: Install 2 plies underlayment over entire roof area, parallel to eaves.

a) Place first ply 18 inches (457 mm) wide at eave edge, with bottom edge extending 1/4 inch (6 mm) over lower edge of eave flashing; seal to eave flashing.

b) Place second ply 36 inches (914 mm) wide over first ply flush at bottom and sealed to first ply.

c) Place third ply 36 inches (914 mm) wide 15 inches (381 mm) up from bottom edge of first ply.

d) Place each successive ply 18 inches (457 mm) up from bottom of each previous ply.

e) Nail horizontal seams 1 inch (25 mm) from exposed edge of felt; space nails in accordance with manufacturer's printed instructions for roof slope.

f) Overlap vertical seams minimum 6 inches (457 mm), seal lap with plastic cement, then nail at 3 inches (76 mm) on center; stagger vertical laps of each successive layer so that vertical joints do not align in any two adjacent plies.

g) Ridges, Except at Ridge Vents: Extend underlayment over ridges 6 inches (152 mm) on each side making a double layer.

h) Hips: Extend underlayment over hips 6 inches (152 mm) on each side making a double layer.

i) Valleys: Overlap metal valley flashing 3 inches (76 mm) and seal to metal.

5. Intersections of Roof Surfaces and Abutting Vertical Surfaces:

a) Install continuous 36 inch (914 mm) wide strips of self seal membrane to extend 30 inches (762 mm) across roof deck and 6 inches (152 mm) up vertical surface.

b) Install continuous metal flashing to extend 3 inches (76 mm) up vertical surface.

c) At locations where vertical surface will abut top edge of tile, install metal flashing to extend 3 inches (76 mm) up vertical surface, form metal flashing to extend minimum 3 inches (76 mm) over tile, and form 1/2 inch (12.5 mm) return hem at edge of metal.

d) Form saddle flashings for protrusions through roof in accordance with manufacturer's printed instructions.

6. Ridge Vent: Install in accordance with manufacturer's printed instructions.

7. Horizontal Battens for Tile Installation: Pressure treated, notched 1 inch (25 mm) by 2 inches (51 mm), nominal.

a) Install ridge batten with top edge approximately 1 inch (25 mm) from ridge nailer or vent.

b) Strike horizontal line for top edge of first batten 15 inches (381 mm) up roof slope, and parallel to, eave edge.

c) Strike intermediate horizontal lines between line for top edge of first batten and top edge of ridge batten; space lines equally, at maximum spacing of 13- 1/2 inches (343 mm).

d) Install battens with top edges aligned with struck lines; nail battens to roof deck at 5-1/4 inches (133 mm) on center, maximum using 5 penny noncorrosive nails long enough to penetrate sheathing.

8. Roof Tile:

a) Install tile right to left, as viewed facing ridge. 7321-10

b) Install closure strips in accordance with manufacturer's printed instructions for project conditions.

c) Fasten tile each tile to battens with two Quarrix High-Low Roofing Screws (2.75" #10 pan-head [.40"] screws) per tile..

d) Fasten tile each tile to battens with two 2 inch 10/11 gauge ring shank 3/8 inch diameter nails and 13-1/2 inches (343 mm) exposure.

e) Cut tile, as tile installation progresses, for hip, valley, and wall conditions.

9. Install venting as tile installation progresses; locate in accordance with manufacturer's instructions.

10. Trim:

a) Install trim pieces for hips, ridges, and rakes as tile installation progresses; cut shapes, set in bed of plastic roof cement, and secure in place with minimum 2 fasteners per piece for rake trim, and minimum 1 fastener per piece for hip and ridge trim.

b) Cut special shapes for project conditions as required.

c) Overlap trim piece ends minimum 3 inches (76 mm); seal overlapping surfaces with plastic roof cement.

11. Counterflashings:

a) Install counterflashings tight to substrates, with top edge of counterflashing concealing base flashings; lap end joints minimum 3 inches (76 mm).

b) Fasten counterflashings using specified fasteners; fasten on vertical surfaces only, at maximum spacing 12 inches (305 mm) on center.

12. Cleanup. Following installation of roofing materials, the roof surface shall be cleaned of all construction materials, traffic grime, accumulated dirt, excess sealants, and other debris. The membrane surface shall be cleaned as recommended by the membrane manufacturer.

END OF SECTION

SECTION 07600
SHEET METAL

PART 1 GENERAL

1.01 SCOPE.

A. This section covers sheet metal for flashings and moisture protection. The following sheet metal items are covered in other sections:

1. Ductwork, louvers, and other sheet metal for the heating, ventilating, and air conditioning system.

2. Metal curbs for skylights and power roof ventilators.

3. Skylights.

4. Roof scuttle.

5. Steel roof deck.

1.02 GENERAL.

A. Installation of wall and roof flashings shall be as indicated on the drawings and as specified in the building masonry and roofing sections.

B. Flashing members to be built into masonry, concrete, or roofing shall be delivered at the proper time for incorporation into the work.

C. When installing sheet metal items, care shall be taken to avoid marring and improper bending. All components shall be stored in clean, dry storage areas. Contact with corrosive or staining materials shall be prevented. All damaged sections shall be replaced and only undamaged units shall be installed.

1.03 SUBMITTALS.

A. Complete specifications, data, and catalog cuts or drawings covering the items furnished under this section shall be submitted in accordance with the Submittals section.

PART 2 PRODUCTS

2.01 MATERIALS.

1. Galvanized Steel ASTM A366 or A569; hot-dip galvanized in accordance with ASTM A525, G90 minimum.

2.	Stainless Steel	ASTM A167, Type 302 or 304, AISI 2B finish unless otherwise specified.
3.	Copper	ASTM B370.
4.	Lead	Fed Spec QQ-L-201, Grade B
5.	Solder	ASTM B32, Alloy Grade 50A (50-50).
6.	Soldering Flux	
7.	For Stainless Steel	Zinc chloride type, Fed Spec 0-F-506, Type II.
8.	For Other Metals	Acid type, Fed Spec O-F-506, Type I, Form A.
9.	Fasteners	Same metal as sheet metal being fastened.
10.	Bird Screen	2 mesh, brass or copper wire cloth, minimum wire diameter 0.063 inch.
11.	Asphalt Roof Coating	ASTM D2823, Type I.
12.	Plastic Cement	Asphalt roof cement, asbestos-free; ASTM D4586, Type II.
13.	Coal Tar Paint Carboline	"Kop-Coat Bitumastic Super Service Black" or Tnemec "46-465 H.B. Tnemecol".
14.	Acrylic Sealant	Pecora "Unicrylic" or Tremco "Mono".

2.02 FLASHINGS.

A. All exposed or contacting flashings shall be of the same material.

1. Types and Materials.

a) Through-Wall Flashing Copper, 10 ounce, or stainless steel, 32 gage, dead soft, fully annealed; ribbed; Architectural Steel "Rib-Bond", Cheney "3-Way Saw-tooth Flashing", or "Keystone Interlocking Type"

b) Cap Flashing Stainless steel, 26 gage, or copper, 16 ounce.

c) Counterflashings Stainless steel, 26 gage, or copper, 16 ounce; Architectural Steel, Cheney, or Keystone, with 4 inch wall flat and hook dam for masonry wall installation.

d) Reglets Stainless steel, 26 gage, or copper, 16 ounce; designed to retain counterflashing by snap action or friction fit; Architectural Steel "Friction reglet", Cheney "Type A", or Keystone "Simplex".

2. Through-Wall Flashings. Through-wall flashings shall be provided as indicated on the drawings. Flashings under copings shall be continuous. Flashings over lintels and under sills shall extend 8 inches past each jamb and shall have ends turned up 1/4 inch.

Wall flashings shall be formed with receivers for counterflashings where required. Joints in wall flashings and receivers for counterflashings shall overlap and shall be interlocked.

Where multiple bends are required for through-wall installation, as indicated on the drawings, flashings may be provided in single-bend sections with vertical legs overlapped to drain to the outside face of the wall.

All inside and outside corners in through-wall flashings shall be watertight and shall be shop fabricated of mitered and soldered sections of the flashing material used elsewhere.

3. Cap Flashings. Cap flashings shall be provided at all roof ventilators, skylights, and elsewhere as indicated on the drawings. Cap flashings shall be fabricated in sections not exceeding 10 feet in length; sections shall overlap at least 3 inches and shall form a slip joint, but shall not be interlocked. All corners and all joints other than slip joints shall be closed watertight as specified herein.

4. Counterflashings. Counterflashings shall be provided at the locations indicated on the drawings to overlap membrane base flashings and fit into flashing reglets or receivers. Counterflashings shall be fabricated in sections not exceeding 10 feet in length; sections shall overlap at least 3 inches and shall form a slip joint, but shall not be interlocked. End joints between counterflashing sections shall be offset from underlying joints between reglet or receiver sections. Corners in counterflashings shall be closed watertight as specified herein.

2.03 PITCH DAMS.

A. Pitch dams shall be provided at vents, sleeves, and elsewhere as indicated on the drawings and as specified in the roofing sections. Pitch dams for vents, sleeves, and pans shall be galvanized steel, 28 gage, 3 inches by height required to extend 1-1/2 inches above roof insulation.

B. Finish shall be a 70 percent Kynar fluoropolymer coating conforming to AAMA 2605. The coping color will be selected from manufacturer's standard and custom color charts.

2.04 HOODS.

A. Counterflashing hoods shall be provided for all conduits and pipes, except vents, which pass through the roof, as indicated on the drawings. Hoods shall be fabricated of 24 gage stainless steel or 22 gage galvanized steel, and shall conform to the details indicated on the drawings.

2.05 MISCELLANEOUS METAL FLASHINGS.

A. Metal flashings shall be provided for vents, sleeves, and similar projections through the roof.

PART 3 EXECUTION

3.01 WATERTIGHT JOINTS.

A. Joints in sheet metal work shall be closed watertight unless slip joints are specifically required. Watertight joints shall be mechanically interlocked and then thoroughly soldered for metals other than aluminum. Joints in aluminum or between aluminum and other metals shall be sealed with acrylic sealant.

B. All joints shall be wiped clean of flux after soldering. Acid flux shall be neutralized by washing the joints with sodium bicarbonate.

3.02 FLASHINGS.

1. Through-Wall Flashings. Installation of through-wall flashings is covered in the building masonry section.

2. Cap Flashings. Cap flashings shall be installed after membrane base flashings have been completed. Cap flashings shall be anchored in place as indicated on the drawings.

3. Counterflashings. Counterflashings shall be installed after membrane base flashings have been completed.

Counterflashings shall be fitted into reglets or receivers and shall be securely locked in place in accordance with the manufacturer's recommendations.

3.03 PITCH DAMS.

A. Pitch dams shall be installed at vents, sleeves, pans, and elsewhere as indicated on the drawings and specified in the roofing sections.

3.04 HOODS.

A. Counterflashing hoods shall be installed as specified in the roofing section.

3.05 MISCELLANEOUS METAL FLASHINGS.

A. Metal flashings shall be installed as specified in the roofing section.

3.06 PROTECTION.

A. Adequate protection shall be provided during shipment, site storage, and installation, to prevent damage to materials or finished work.

B. Aluminum to be placed in contact with concrete, mortar, or dissimilar metals shall be given a heavy coat of coal tar paint.

END OF SECTION

SECTION 07900
CAULKING

PART 1 GENERAL

1.01 SCOPE.

A. This section covers caulking and sealing.

1.02 GENERAL.

A. The terms "caulking" and "sealing", as used on the drawings and in these specifications, are synonymous. Both terms indicate the materials specified herein. Oil-base caulking shall not be used on this project.

1.03 APPROVALS.

A. All caulking shall meet the requirements of the standards specified herein. All caulking and sealing to be used in contact with potable water shall meet the requirements of ANSI/NSF Standard 61.

1.04 SUBMITTALS.

A. Specifications and data covering the materials proposed for use, together with samples or color cards showing the manufacturer's full line of sealant colors, shall be submitted in accordance with the Submittals section.

PART 2 PRODUCTS

2.01 MATERIALS.

Thiokol Sealants (polysulfides)	Fed Spec TT-S-00227E, Class A or ASTM 920 Type M; polysulfide rubber, two component.
Nonsag	
Submerged Service, Non potable water	Pecora "Synthacalk GC-2+"; Sonneborn "Sonolastic Polysulfide Sealant".
Nonsubmerged Service	Pecora "Synthacalk GC-2+"; Sonneborn "Sonolastic Polysulfide Sealant"; Polymeric Systems "PSI-350".
Self-Leveling, nonsubmerged	C. Horn "Hornflex Traffic Grade"; Polymeric Systems "PSI-350".

Urethane Sealants (Polyurethanes)	Fed Spec TT-S-00227E, Class A, Type 2 and ASTM C920, Type M, Grade NS, two component.
Nonsag Submerged Service Potable Water	Polymeric Systems "RC-270"; Sika "Sikaflex-2cNS.
Nonpotable Water	Pecora "Dynatred"; Polymeric Systems "RC-270".
Nonsubmerged Service	Bostik "Chem-Calk 500"; Tremco "Vulkem 227"; Pecora "Dynatrol II"; Tremco "DYmeric 240"; Sika "Sikaflex-2cNS".
Self-Leveling, Nonsubmerged Service	Bostik "Chem-Calk 550"; Tremco "Vulkem 245"; Pecora "Urexpan NR-200"; Polymeric Systems " RC-2SL"; Tremco "THC-900".
Acrylic Sealant	Fed Spec TT-S-230; ASTM C834.
	Bostik "Chem-Calk 600"; Pecora " AC20"; Tremco "Mono 555".
Silicone Sealant	Silicone rubber, neutral color; Dow Corning "Mildew-Resistant silicone 786"; General Electric "Silicone Sanitary 1702 Sealant".
Primer	As recommended by the sealant manufacturer.
Backup Material	Polyethylene or polyurethane foam as recommended by the sealant manufacturer; Dow "Ethafoam SB" or Plateau "Denver Foam".
Bondbreaker Tape	Adhesive-backed polyethylene tape as recommended by the sealant manufacturer.
Fire Barrier Caulk	3M "fire Barrier Caulk CP-25" or 3M "Putty 303".

2.02 COLORS.

A. Colors of sealants shall be as selected by Architect from the manufacturer's standard line of colors. Different colors may be required for different locations.

2.03 LOCATIONS TO BE CAULKED.

A. With Thiokol or Urethane Sealant (Nonsag) - Submerged Service. All joints requiring caulking in submerged locations.

B. With Thiokol or Urethane Sealant (Nonsag) - Nonsubmerged Service.

C. Entire interior and exterior perimeter of frames for exterior metal doors.

D. Entire interior and exterior perimeter of metal louvers.

E. Control joints in masonry walls.

F. Joints between masonry and cast-in-place concrete, where indicated on the drawings.

G. Other locations where caulking is indicated on the drawings, specified in other sections, or required for weatherproofing.

H. With Thiokol or Urethane Sealant (Self-Leveling).

I. Horizontal joints in walks or drives.

J. Horizontal joints in traffic-bearing decks and slabs.

K. Annular space around handrail posts set in sleeves.

L. 2-3.04. With Acrylic Sealant. Watertight joints in sheet metal work

M. 2-3.05. With Fire Barrier Caulk.

N. All joints and closures at fire rated walls and floors, unless noted otherwise

PART 3 EXECUTION

3.01 JOINT PREPARATION.

A. All surfaces to receive sealant shall be clean, dry, and free from dust, grease, oil, or wax. Concrete surfaces which have been contaminated by form oil, paint, or other foreign matter which would impair the bond of the sealant to the substrate shall be cleaned by sandblasting. All surfaces shall be wiped with a clean cloth saturated with xylol or other suitable solvent, and shall be primed before the sealant is applied.

B. Unless otherwise recommended by the sealant manufacturer and permitted by the Engineer, the depth of sealant in a joint shall be equal to the width of the joint, but not more than 1/2 inch. Backup material shall be provided as necessary to control the depth of sealant and shall be of suitable size so that, when compressed 25 to 50 percent, the space will be filled. Backup material shall be rolled or pressed into place in accordance with the manufacturer's installation instructions, avoiding puncturing and lengthwise stretching. If depth of the joint does not permit use of backup material, bondbreaker tape shall be placed at the bottom of the joint to prevent three-sided adhesion.

3.02 SEALING.

A. Sealing work shall be done before any field painting work is started. The air temperature and the temperature of the sealed surfaces shall be above 50°F when sealing work is performed.

B. Upon completion of the sealing work, each sealed joint shall have a smooth, even, tooled finish, flush with the edges of the sealing recess, and all adjacent surfaces shall be clean. Sealant shall not lap onto adjacent surfaces. Any sealant so applied as to prevent the painting of adjacent surfaces to a clean line, or with an excess of material outside the joint and feathered onto surfaces, shall be removed and the joint resealed.

END OF SECTION

SECTION 08347
ACOUSTICAL STEEL DOORS AND FRAMES

PART 1 GENERAL

1.01 SCOPE.

A. This section covers metal sound control door assemblies. Unless otherwise indicated or specified, all steel doors shall be flush type.

B. Finish hardware is covered in the Finish Hardware section.

1.02 GENERAL.

A. Doors, frames, and appurtenances shall be furnished and installed as specified herein and in accordance with the details and arrangements indicated on the drawings.

B. Doors, frames, and appurtenances furnished under this section shall be fabricated and assembled and erected, in full conformity with drawings, specifications, engineering data, instructions, and recommendations of the manufacturer unless exceptions are noted by Engineer.

C. Coordinate installation of anchorage for sound control door assemblies. Furnish setting drawings, templates, and directions for installing anchorages. Deliver sleeves, inserts, anchor bolts, and items with integral anchors to Project site in time for installation.

1.03 SUBMITTALS.

A. Complete detail drawings of all items specified herein shall be submitted in accordance with the Submittals section. Drawings shall show elevations of each door type; details of each frame type; location or identification of each item; typical and special details of construction; methods of assembling sections; location and installation requirements for hardware; size, shape, and thickness of materials; joints; connections; and finish.

1.04 DELIVERY, STORAGE, AND HANDLING.

A. Shipping shall be in accordance with the Shipping section. Handling and storage shall be in accordance with the Handling and Storage section.

B. Materials shall be handled, transported, and delivered in a manner which will prevent bends, dents, scratches, or damages of any kind. Damaged materials shall be promptly replaced.

PART 2 PRODUCTS

2.01 PERFORMANCE AND DESIGN CRITERIA.

A. Governing Standard. Except as modified or supplemented herein, all steel doors and frames shall conform to the requirements of ANSI/SDI 100, Grade II, Model 2.

B. Metal Thicknesses. Metal thicknesses and gages of steel sheet metal specified herein are the minimum required. Gages refer to US Standard gage.

C. Nomenclature. The nomenclature used herein conforms to ANSI A123.1.

D. Sound Rating. Provide sound control door assemblies identical to those of assemblies tested with sound-retardant unites by an acoustical testing agency, and have the following minimum rating:

1. STC Rating: 43 or higher, as calculated by ASTM E 413 when tested in an operable condition according to ASTM E 90.

2.02 ACCEPTABLE PRODUCTS.

A. Basis-of-Design product for doors and frames is "Noise-Lock" by Industrial Acoustics Company (IAC) or approved equivalent.

2.03 MATERIALS.

A. Materials used in the manufacture of steel doors and frames shall be as follows:

Doors and Frame	ASTM A366 or A569, stretcher leveled, commercial quality sheet steel with smooth, clean surface;galvanized, per ASTM A653 with G90 minimum coating.
Internal Reinforcing	ASTM A366, cold-rolled steel.
Fillers for Internally Reinforced Doors	Mineral wool or fiberglass.
Urethane Core for foamed in place doors	Liquid urethane, expanded in place self-bonding, self-hardening, and self-extinguishing.
Polystyrene core for raised panel doors	Preformed, block type polystyrene insulation, ASTM C578.
Anchoring Devices	Zinc-plated where exposed; zinc- plated or galvanized where concealed; non-corrosive.

Expansion Anchors	As specified in the Anchorage in Concrete and Masonry section.
Tape Sealant	PVC or neoprene closed-cell foam, black, 1/2 inch [12 mm] wide by 1/4 inch [6 mm] thick strip with pressure-sensitive adhesive back; Williams "Everlastic NN-1" or Blanchard "Foamgard".

2.04 FRAMES.

A. Fabricate sound control door frames wit corners mitered, reinforced, and continuously welded the full depth and width of frame. Fabricate according to NAAHM-HMMA 865.

1. Workmanship. The finished work shall be strong, rigid, neat, and free from defects. Molded members shall be fabricated straight and true, with corner joints well formed, and with fastenings concealed where practicable.

2. Joints. Joints for frames shall be mitered or butted and continuously welded on the reverse side to produce rigid joints which are invisible on the face of the frame. Frame bottoms shall be held rigidly in position by spreader bars to maintain proper alignment during shipment and erection.

3. Hardware Provisions. Frames shall be prepared at the factory for the specified hardware. Frames shall be mortised, reinforced, drilled, and tapped for mortised hardware, and shall be reinforced for surface-applied hardware. Cover boxes shall be provided in back of all hardware cutouts. Frames for all doors except weatherstripped doors shall be punched to receive silencers, three holes on the lock side of single door frames and one hole for each leaf in heads of double door frames. Lock strikes shall be set out and adjusted to provide clearance for silencers.

Concealed metal reinforcements shall be provided for hardware in at least the following thicknesses:

Hinge reinforcement	10 gage [3.42 mm]
Strike reinforcement	14 gage [1.89 mm]
Closer reinforcement	12 gage [2.66 mm]
Other reinforcement	14 gage [1.89 mm]

4. Mullions and Transom Bars. Mullions and transom bars shall be of reinforced tubular construction, connecting neatly with heads

and jambs and secured in place by concealed interlocking joints or by welding. Removable transom bars shall be connected to frames at jambs by concealed fasteners. Cutouts or removable plates shall be provided for access to fasteners.

5. Reinforcing. Where structural steel members are indicated at mullions, transoms, or other locations, and are required to be built into hollow metal frames, the structural steel shapes shall be provided as part of the frame assembly.

6. Wall and Floor Anchors. Metal anchors of the sizes and shapes required for the adjoining type of wall construction shall be provided. Jamb anchors shall be fabricated from steel, of at least the same thickness as the frames. Anchors shall be located near the top and bottom of each frame and at intermediate points spaced not more than 32 inches [800 mm] apart.
For frames set in masonry, jamb anchors shall be at least 10 inches [250 mm] long, adjustable, and corrugated or other deformed type.For frames set in metal stud partitions, anchors shall be welded to the backs of frames. Anchors shall be fastened to steel studs with 1/4 inch [6 mm] diameter machine bolts, or by welding.For frames set in hardened concrete or existing masonry walls, anchorage shall be provided as indicated on the drawings. Door frames shall be provided with a 16 gage [1.52 mm] thick base clip at each jamb for floor anchorage. Clips shall be sized and drilled for at least two 3/8 inch [10 mm] diameter anchoring devices. Where floor fill occurs at a door opening, the bottom of the frame shall terminate at the indicated finished floor level and shall be supported by adjustable extension clip angles anchored to the structural slab.

7. Stops and Beads. Metal glazing beads shall be furnished with hollow metal frames at transoms, sidelights, interior glazed panels, and other locations where glazed frames are indicated on the drawings. Glazing stops shall be formed as an integral part of the frames, and the frames shall be prepared to receive the glazing beads. Where frames are exposed to weather, the integral stops shall be located on the exterior side of the frames. Beads having a molded shape shall be mitered at corners. Rectangular beads may be either mitered or butted at corners.

2.05 DOORS.

A. Flush-design sound control doors, minimum 1-3/4 inches thick or thickness required to provide STC rating, of seamless construction; with manufacturer's standard sound-retardant core as required to provide STC and fire rating indicated. Construct doors with smooth, flush surfaces

without visible joints or seams on exposed faces or stile edges. Fabricate according to NAAHM-HMMA 865.

1. Workmanship. Doors shall be rigid, neat in appearance, and free from defects. Molded members for glazed doors shall be formed straight and true, with joints coped or mitered, well formed, and in true alignment. All welded joints on exposed surfaces shall be dressed smooth so that they are invisible after finishing.

2. Sizes and Clearances. Doors shall be of 1-3/4 inch thickness, and type indicated on the drawings, of the sizes and design indicated. Clearances for doors, except fire doors, shall be 1/8 inch [3 mm] at jambs and heads, 1/4 inch [6 mm] at meeting stiles of pairs of doors, and 3/4 inch [20 mm] at bottom, unless otherwise indicated.

3. Exterior Doors. Fabricate from metallic-coated steel sheet 0.052-inch nominal thickness or thicker as required to provided STC rating indicated.

4. Interior Doors. Fabricate from cold-rolled steel sheet, 0.048-inch nominal thickness or thicker as required to achieve STC rating indicated.

5. Core. Manufacturer's standard sound control core.

6. Hardware Provisions. Doors shall be mortised, reinforced, drilled, and tapped for mortised hardware. Reinforcing units shall be provided for locksets. Reinforcing plates shall be provided for mortised and surface-applied hardware in at least the following thicknesses:

Hinge reinforcement	10 gage [3.42 mm]
Surface-applied closers and hold-open arms	12 gage [2.66 mm]
Other reinforcement	14 gage [1.89 mm]

Where concealed overhead door closers are required, the necessary cutouts, reinforcement, and provisions for fasteners shall be made in the heads of doors.

The locations of hardware items shall be in accordance with DHI "Recommended Locations for Builders' Hardware for Standard Steel Doors and Frames".

7. Stops and Beads. Metal glazing beads shall be furnished with hollow metal doors where glazed doors are indicated on the drawings. Glazing stops may be formed as an integral part of the

doors, or separate glazing beads provided for both sides of the glass. Doors shall be prepared to receive the glazing beads. Beads shall be snapped into place, or shall be fastened with oval-head machine screws spaced at 9 inch [225 mm] centers maximum. Beads having a molded shape shall be mitered at corners. Rectangular beads may be either mitered or butted at corners. Where glazed doors are exposed to weather, all seams and joints on all sides of the glass panel, except joints in removable beads, shall be closed watertight as specified for side edges.

8. Astragals. The meeting edges of all exterior double doors, of interior double doors scheduled to be weatherstripped shall be provided with astragals. Astragals shall be applied to the active leaf unless otherwise indicated. When the astragal is attached to the inactive leaf, the active leaf shall be prepared for a lockset with a 3-3/4 inch [95 mm] backset.

2.06 SHOP FINISH.

A. A primer shall be applied to all surfaces of ferrous metal furnished under this section. Metal surfaces shall be cleaned and given a phosphate or equivalent treatment to ensure maximum corrosion protection and paint adherence. A dip or spray coat of synthetic resin, rust-inhibitive metallic oxide, or rust-inhibitive zinc chromate primer shall be applied to all surfaces, then baked or oven-dried. Finished surfaces shall be smooth and free from irregularities.

PART 3 EXECUTION

3.01 INSTALLATION.

A. Frames shall be set in position, plumbed, aligned, and braced securely until permanent anchors are set. Frames shall be anchored to floors with expansion anchors or as indicated on the drawings. Jamb anchors shall be built into walls and secured to adjoining construction. Spreader bars shall remain in place until frames have been built into the walls.

1. Glazing Beads. Glazing beads, when provided, shall be fastened to frames with oval-head machine screws spaced at 9 inch [225 mm] maximum centers.

END OF SECTION

SECTION 08700
FINISH HARDWARE

PART 1 - GENERAL

1-1. SCOPE. This section covers finish hardware, including mechanical and electronic door hardware for steel doors, together with cylinders and padlocks which must be keyed to match door locks.

1-2. GENERAL.

1-2.01. Templates. Each hardware manufacturer shall deliver to the door and frame manufacturer a template for each item of mortised and surface-applied hardware. Each template shall be labeled with the manufacturer's name, hardware item, opening number, and location on the door or frame where the item is to be installed.

1-3. SUBMITTALS. A complete schedule of finish hardware shall be submitted in accordance with the submittals section. The schedule shall indicate each item of hardware required for each opening, manufacturer's name, manufacturer's number or symbol, and finish. Include electronic locking elevations and keying schedule.

1-4. PACKAGING. Each item of hardware shall be packaged separately in an individual container complete with screws, keys, special wrenches, instructions, and installation templates necessary for accurately locating, setting, adjusting, and attaching the hardware. Each container shall be marked with the number of the opening to which the hardware item is to be applied.

PART 2 - PRODUCTS

2-1. ACCEPTABLE MANUFACTURERS. The catalog numbers which appear in the Hardware Schedule identify products of the first-named of the manufacturers listed herein for each hardware item. Equivalent products of the other manufacturers listed herein will also be acceptable.

Butts	Stanley, Hager, or Lawrence.
Locksets & latchsets	Schlage, Yale, or Corbin-Russwin.
Exit devices	Von Duprin, Corbin-Russwin
Lock guards	Ives
Closers	LCN or Sargent.
Holders, bumpers, and silencers	Glynn-Johnson or Corbin-Russwin.
Thresholds, cast abrasive	Wooster, American Abrasive, or Stubbs.

Thresholds and drip caps, Extruded	Reese, Zero, or Pemko.
Flush bolts	Ives or Quality.
Weatherstripping	Reese, Zero, or Pemko.

2-2. FINISH. The required finish shall be as indicated by the catalog number listed in the Hardware Schedule herein. Exterior surfaces of door closers shall be finish painted with shop-applied aluminum paint. Machine screws, bolts, and other exposed attachments shall be finished to match hardware.

2-3. KEYING. Cylinder locks and padlocks shall be keyed in groups. After the finish hardware submittals have been accepted by the Engineer, the Engineer and Owner will meet with the Contractor to determine the keying groups.

All locks in each group shall be keyed alike and each group shall be keyed differently. All locks shall be operable by a master key or by master key groups and a grand master key. Two keys shall be furnished with each lock. Six master keys shall be furnished.

2-4. ELECTRONIC LOCKSETS AND HINGE DEVICES. Provide electronic locksets and hinge devices meeting the following requirements.

1. Provide heavy-duty mortise type electronic locksets and trim, without dead bolt and conforming to the requirements of Part 2.02, Paragraphs A and B of this section.
2. Contain a transistorized circuit that provides full voltage to the solenoid upon initial application of electrical power and at five to 10 second intervals.
3. Use 24 VAC/DC electrical power.
4. Mortise lockset cylinder housing shall accept a best access systems interchangeable seven-pin core.
5. Be of the electrical unlocked type, fail secure.

PART 3 – EXECUTION

3-1. INSTALLATION. Hardware shall be accurately fitted, securely applied, carefully adjusted, and lubricated in accordance with the manufacturer's instructions.

3-1.01. Location. Unless otherwise directed by the Engineer, the locations of hardware items shall be in accordance with DHI "Recommended Locations for Builders' Hardware for Standard Steel Doors and Frames".

3-1.02. Thresholds. The ends of thresholds shall be notched to fit the applicable door frame

profile. Thresholds shall be field drilled to receive flush bolts where required. Thresholds shall be anchored to concrete by means of 5/16 inch diameter stainless steel flat head countersunk machine screws and expansion anchors spaced at 8 inch centers. Thresholds shall be set in asphalt roofing cement conforming to ASTM D4586, Type II.

3-2. ADJUSTING. Each supplier of finish hardware shall provide the services of a trained and experienced hardware consultant to service and adjust installed hardware.

3-3. PROTECTION. Special care shall be taken to protect finished surfaces of hardware during installation. Hardware on which the finish has been damaged prior to final acceptance of the work shall be replaced with new hardware at no additional cost to the Owner.

3-4. HARDWARE SCHEDULE. Hardware shall be furnished in accordance with the following schedule. Doors are listed by group number. A complete set of hardware is listed for each group.

Heading 001

1	PR	Door 1-1	EXTERIOR / PUMP ROOM 101
1	PR	Door 1-2	EXTERIOR / PUMP ROOM101

2/3' 0" X 7' 0" X 2 1/2" X HMD X HMF X NONRTD
INTEGRATED SOUND DOOR.
SOUND SEALS BY THE INTEGRATED HOLLOW METAL DOOR MANUFACTURER, FOUR SIDES. REFER TO HOLLOW METAL SPECIFICATION SECTION.
VERIFY LENGTH OF THRESHOLD AT THE JOB SITE BEFORE ORDERING.
PROVIDE FASTENERS FOR 2 1/2 THICK DOOR.

Each Assembly to have:

6	EA	CAM LIFT HINGES	Z950 4 1/2 X 5	630	ZER
1	EA	PANIC HARDWARE	AX-9927-EO-LBR	626	VON
1	EA	PANIC HARDWARE	AX-9927-NL-OP-LBR-110MD	626	VON
1	EA	ROD AND LATCH GUARD	RG-27-EXTENDED	US32D	VON
1	EA	RIM CYLINDER	20-057	626	SCH
1	EA	DOOR PULL	VR910 NL	630	IVE
2	EA	SURFACE CLOSER	4021 SRI	689	LCN
2	EA	MOUNTING PLATE	SRI 4020-18G	689	LCN
2	EA	FLOOR STOP/HOLDER	FS43	626	IVE
1	EA	RAIN DRIP	142A	AL	ZER
1	EA	THRESHOLD	68A X 676A-E X 69A X WELDED	628	ZER
2	EA	STRIKE MTD PLATE	770SPB	600	ZER

INTEGRATED SOUND DOOR.
SOUND SEALS BY THE INTEGRATED HOLLOW METAL DOOR MANUFACTURER, FOUR SIDES.
REFER TO HOLLOW METAL SPECIFICATION SECTION.
VERIFY LENGTH OF THRESHOLD AT THE JOB SITE BEFORE ORDERING.
DOOR BOTTOM SEALS RECESSED. THRESHOLD BY THE SOUND INTEGRATED DOOR MANUFACTURER.
PROVIDE FASTENERS FOR 2 1/2 THICK DOOR.

Free Egress at all times. Pressing Push Bar retracts latchbolts. No exterior trim. Dogging by hex key, locks down the pushbar or crossbar so the latchbolt remains retracted.
Free Egress at all times. Pressing Push Bar retracts latchbolts. Trim always locked, entrance by optional trim when key retracts latchbolt from pull side. Dogging by hex key, locks down the pushbar or crossbar so the latchbolt remains retracted.
Self-Closing.

Heading 002

1 SGL Door 1-4 EXTERIOR / ELECTRICAL 102
3' 0" X 7' 0" X 2 1/2" X HMD X HMF X NONRTD
INTEGRATED SOUND DOOR.
SOUND SEALS BY THE INTEGRATED HOLLOW METAL DOOR MANUFACTURER, FOUR SIDES. REFER TO HOLLOW METAL SPECIFICATION SECTION.
VERIFY LENGTH OF THRESHOLD AT THE JOB SITE BEFORE ORDERING.
PROVIDE FASTENERS FOR 2 1/2 THICK DOOR.

Each Assembly to have:

1	EA	CAM LIFT HINGES	Z950 4 1/2 X 5	630	ZER
1	EA	PANIC HARDWARE	AX-99-NL-OP-110MD	626	VON
1	EA	RIM CYLINDER	20-057	626	SCH
1	EA	DOOR PULL	VR910 NL	630	IVE
1	EA	SURFACE CLOSER	4021 SRI	689	LCN
1	EA	MOUNTING PLATE	SRI 4020-18G	689	LCN
1	EA	FLOOR STOP/HOLDER	FS43	626	IVE
1	EA	RAIN DRIP	142A	AL	ZER
1	EA	THRESHOLD	68A X 676A-E X 69A X WELDED	628	ZER
1	EA	STRIKE MTD PLATE	770SPB	600	ZER

INTEGRATED SOUND DOOR.
SOUND SEALS BY THE INTEGRATED HOLLOW METAL DOOR MANUFACTURER, FOUR SIDES.
REFER TO HOLLOW METAL SPECIFICATION SECTION.
VERIFY LENGTH OF THRESHOLD AT THE JOB SITE BEFORE ORDERING.
DOOR BOTTOM SEALS RECESSED. THRESHOLD BY THE SOUND INTEGRATED DOOR MANUFACTURER.
PROVIDE FASTENERS FOR 2 1/2 THICK DOOR.
PROVIDE FASTENERS FOR 2 1/2 THICK DOOR.
PROVIDE ELECTRONIC LOCK AND HINGE

Free Egress at all times. Pressing Push Bar retracts latchbolts. Trim always locked, entrance by optional trim when key retracts latchbolt from pull side. Dogging by hex key, locks down the pushbar or crossbar so the latchbolt remains retracted.
Self-Closing.

Heading 003

1 PR Door 1-5 EXTERIOR / MECHANICAL 103
2/3' 0" X 7' 0" X 1 3/4" X HMD X HMF X NONRTD
SOUND SEALS.

Each Assembly to have:

2	EA	CONT. HINGE	700	630	IVE
1	SET	AUTO FLUSH BOLT	FB31P	630	IVE
1	EA	CORRIDOR W/DEADBOLT	L9456F LLL 03A L583-363 L283-150 X 7/8"STRAIGHT LIP STRIKE	630	SCH
1	EA	DOOR PULL	VR900 LLP	630	IVE
1	EA	COORDINATOR	COR7G	626	IVE
2	EA	SURFACE CLOSER	4041 DEL HEDAW/62G	689	LCN
2	EA	CUSH SHOE SUPPORT	4040-30	689	LCN
2	EA	BLADE STOP SPACER	4040-61	689	LCN
2	EA	KICK PLATE	8400 10" X 1" LDW B4E	630	IVE
2	EA	FLOOR STOP	FS18L	BLK	IVE
1	EA	GASKETING	170AA HEAD AND JAMBS	AA	ZER
1	EA	ASTRAGAL	383AA	AA	ZER
2	EA	DOOR BOTTOM	361AA6-Z49	AA	ZER
1	EA	THRESHOLD	564A-MSLA-10	A	ZER

SOUND SEALS.

Latchbolt retracted by knob/lever from either side. Deadbolt thrown or retracted by key outside or inside thumbturn. Throwing deadbolt locks outside knob/lever. Turning inside knob/lever simultaneously retracts deadbolt and latchbolt and unlocks outside knob/lever. Inside lever is always free for immediate egress. ADA Thumbturn.
Self-Closing. Delays closing from maximum opening to approximately 70 degrees. 1 minute maximum delay time.

Heading 004

1 SGL Door 102C ELECTRICAL ROOM 102 / PUMP ROOM 102
3' 0" X 7' 0" X 1 3/4" X HMD X HMF X NONRTD

Each Assembly to have:

3	EA	HINGE	5BB1 4.5 X 4 NRP	630	IVE
1	EA	PANIC HARDWARE	AX-99-L-17 SS-US32D	US32D/ 626	VON
1	EA	RIM CYLINDER	20-057	626	SCH
1	EA	SURFACE CLOSER	4041 DEL SHCUSH SRI	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B4E	630	IVE
3	EA	SILENCER	SR65	GRY	IVE

Free Egress at all times. Pressing Push Bar retracts latchbolts. Latchbolt retracted by lever unless locked by key. Key locks and unlocks lever. Dogging by hex key, locks down the pushbar or crossbar so the latchbolt remains retracted.
Self-Closing. Templating allows Spring CUSH Arm to stop the door's swing between 85 and 110 degrees with hold-open feature. Delays closing from maximum opening to approximately 70 degrees. 1 minute maximum delay time.

Heading 005

1 PR Door 1-3 EXTERIOR / MECHANICAL 103
2/3' 0" X 7' 0" X 1 3/4" X HMD X HMF X NONRTD
SOUND SEALS.
DOOR BOTTOM SEALS RECESSED.

Each Assembly to have:

2	EA	CONT. HINGE	700	630	IVE
1	EA	PANIC HARDWARE	9927-EO	626	VON
1	EA	PANIC HARDWARE	9927-NL-OP-110MD	626	VON
2	EA	ROD AND LATCH GUARD	RG-27-EXTENDED	US32D	VON
1	EA	RIM CYLINDER	20-057	626	SCH
1	EA	DOOR PULL	VR910 NL	630	IVE
2	EA	SURFACE CLOSER	4021 SRI	689	LCN
2	EA	MOUNTING PLATE	SRI 4020-18G	689	LCN
2	EA	FLOOR STOP/HOLDER	FS43	626	IVE
1	EA	RAIN DRIP	142A	AL	ZER
1	EA	GASKETING	170AA HEAD AND JAMBS	AA	ZER
1	EA	ASTRAGAL	156AA X 56AA	AA	ZER
2	EA	DOOR BOTTOM	360AA	628	ZER
1	EA	THRESHOLD	564A-MSLA-10	A	ZER
2	EA	STRIKE MTD PLATE	770SPB	600	ZER

SOUND SEALS.
DOOR BOTTOM SEALS RECESSED.

Free Egress at all times. Pressing Push Bar retracts latchbolts. Trim always locked, entrance by optional trim when key retracts latchbolt from pull side. Dogging by hex key, locks down the pushbar or crossbar so the latchbolt remains retracted.
Free Egress at all times. Pressing Push Bar retracts latchbolts. No exterior trim. Dogging by hex key, locks down the pushbar or crossbar so the latchbolt remains retracted.
Self-Closing.

Heading 006

1 PR Door 1-6 EXTERIOR / SDGE STORAGE 104
2/3' 0" X 7' 0" X 2 1/2" X HMD X HMF X NONRTD
INTEGRATED SOUND DOOR.
SOUND SEALS BY THE INTEGRATED HOLLOW METAL DOOR MANUFACTURER, FOUR SIDES. REFER TO HOLLOW METAL SPECIFICATION SECTION.

Each Assembly to have:

1	EA	CAM LIFT HINGES	Z950 4 1/2 X 5	630	ZER
1	SET	AUTO FLUSH BOLT	FB31P	630	IVE
1	EA	DUST PROOF STRIKE	DP2	626	IVE
1	EA	CORRIDOR W/DEADBOLT	L9456F LLL 03A L583-363 L283-150 X 7/8"STRAIGHT LIP STRIKE	630	SCH
1	EA	DOOR PULL	VR900 LLP	630	IVE
1	EA	COORDINATOR	COR7G	626	IVE
2	EA	SURFACE CLOSER	4021 SRI	689	LCN
2	EA	MOUNTING PLATE	SRI 4020-18G	689	LCN
2	EA	KICK PLATE	8400 10" X 1" LDW B4E	630	IVE
2	EA	FLOOR STOP/HOLDER	FS43	626	IVE

INTEGRATED SOUND DOOR.
SOUND SEALS BY THE INTEGRATED HOLLOW METAL DOOR MANUFACTURER, FOUR SIDES.
REFER TO HOLLOW METAL SPECIFICATION SECTION.
VERIFY LENGTH OF THRESHOLD AT THE JOB SITE BEFORE ORDERING.
DOOR BOTTOM SEALS SURFACE MOUNTED. THRESHOLD BY THE SOUND INTEGRATED DOOR MANUFACTURER.
PROVIDE FASTENERS FOR 2 1/2 THICK DOOR.

Latchbolt retracted by knob/lever from either side. Deadbolt thrown or retracted by key outside or inside thumbturn. Throwing deadbolt locks outside knob/lever. Turning inside knob/lever simultaneously retracts deadbolt and latchbolt and unlocks outside knob/lever. Inside lever is always free for immediate egress.
ADA Thumbturn.
Self-Closing.

END OF SECTION

SECTION 08800
GLASS AND GLAZING

PART 1 GENERAL

1.01 SCOPE.

A. This section covers glass and glazing for windows, doors, and other openings having glass as indicated on the drawings and as stipulated herein.

1.02 GENERAL.

A. Except as modified or supplemented herein, all glazing shall be in accordance with the recommendations of the Flat Glass Marketing Association (FGMA).

B. Tempered glass and laminated glass shall conform to the requirements for glazing materials for Category II products in accordance with the Safety Standard for Architectural Glazing Materials, 16 CFR 1201, January 6, 1977, as amended.

1.03 SUBMITTALS.

A. Complete specifications and data covering the items furnished under this section shall be submitted in accordance with the Submittals section.

1.04 LABELS.

A. All glass shall be delivered to the work bearing the original manufacturer's labels. These labels shall not be removed until just prior to the final window cleaning.

PART 2 PRODUCTS

2.01 MATERIALS.

A. Materials shall conform to the following:

Tempered Glass	Plate or float, fully tempered, ANSI Z97.1 or ASTM C1048.
Clear	1/4 inch; PPG "Herculite" or Spectrum "Tuf-flex".
Laminated Glass	1/4 inch nominal thickness, ANSI Z97.1; ASTM C1172; two 1/8 inch thick sheets of float glass with vinyl interlayer.

Clear	ASTM C1172, Kind LA, clear.
Security Laminated Glass	1 inch nominal thickness; five plies of 3mm heat strengthened glass bonded together with four plies of 090 polyvinyl butyral.
Frosted	
Security Laminated Glass	ASTM F1233, Class 1 Body Passage and Class 1 Contraband Passage; Oldcastle Glass ArmorProtect #112000. LOCATION: All exterior window glazing.
Glazing Compound	ASTM C669.
Extruded Tape	Pecora "B-44 Extru-Seal", Protective Treatments "PTI 606", or Tremco "440 Tape".
Acrylic Sealant	Pecora "Unicrylic" or Tremco "Mono".
Setting	BlocksSoft lead or neoprene.
Spacers	Cork and rubber; Rhopac "Adhesive Backed Spacer Blocks".
Glazing Clips	Spring wire.

PART 3 EXECUTION

3.01 GLAZING.

A. All glass sizes shall be obtained from measurements of the work at the site or from the manufacturer of the doors or frames in which the glass is to be set. In all cases, however, the Contractor shall be responsible for the correctness of the size of the glass. Locations for each type of glass shall be as indicated or scheduled on the drawings.

1. Hollow Metal Doors and Frames. Glass in hollow metal doors and frames shall be set in glazing compound and held in place with the glazing stops and beads provided. Spacers held 1/4 inch below sight line shall be provided between the glass and the tops or beads if required to position the glass. Each glass panel shall be cushioned so that it is free from strain or binding due to uneven pressure at the stops.

2. Aluminum Assemblies. Glass in aluminum assemblies employing extruded gasket glazing shall be set with the gaskets and stops supplied by the manufacturer of such assemblies and in accordance with the manufacturer's instructions.

3. Other Glass. All other glass shall be set as required by the glazing facilities provided and the glass embedment requirements.

3.02 LABELS.

A. All glass shall be delivered to the work bearing the original manufacturer's labels. These labels shall not be removed until just prior to the final window cleaning.

1. Provide security glazing labeling.

3.03 PROTECTION AND CLEANING.

A. All glass shall be protected against breakage during the construction period, and all broken or cracked glass shall be replaced at the time of completion of the work.

B. All glass shall be cleaned just before final inspection, and all stains and defects shall be removed. Care must be exercised to remove paint, labels, and glazing compound without scratching or marring the surface of the glass or metal work.

END OF SECTION

SECTION 092400
PORTLAND CEMENT PLASTERING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Section 01300 – Submittals

B. Section 04220 - Building Masonry

1.02 SUMMARY

A. Section Includes:

1. Exterior portland cement plasterwork (stucco) on metal lath.

1.03 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Show locations and installation of control and expansion joints including plans, elevations, sections, details of components, and attachments to other work.

C. Samples for Initial Selection: For each type of factory-prepared finish coat indicated.

D. Samples for Verification: For each type of colored and textured finish coat indicated; 12 by 12 inches (305 by 305 mm), and prepared on rigid backing.

1.04 QUALITY ASSURANCE

A. Preinstallation Conference: Conduct conference at Project site.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Store materials inside under cover and keep them dry and protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic, and other causes.

1.06 PROJECT CONDITIONS

A. Comply with ASTM C 926 requirements.

B. Exterior Plasterwork:

1. Apply and cure plaster to prevent plaster drying out during curing period. Use procedures required by climatic conditions, including moist curing, providing coverings, and providing barriers to deflect sunlight and wind.

2. Apply plaster when ambient temperature is greater than 40 deg F (4.4 deg C).

3. Protect plaster coats from freezing for not less than 48 hours after set of plaster coat has occurred.

C. Factory-Prepared Finishes: Comply with manufacturer's written recommendations for environmental conditions for applying finishes.

PART 2 PRODUCTS

2.01 METAL LATH

A. Expanded-Metal Lath: ASTM C 847 with ASTM A 653/A 653M, G60 (Z180), hot-dip galvanized zinc coating.

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) Alabama Metal Industries Corporation; a Gibraltar Industries company.

b) CEMCO.

c) Clark Western Building Systems.

d) Dietrich Metal Framing; a Worthington Industries company.

e) MarinoWARE.

f) Phillips Manufacturing Co.

g) Or Equal.

2. Diamond-Mesh Lath: Self-furring, 2.5 lb/sq. yd.

2.02 ACCESSORIES

A. General: Comply with ASTM C 1063 and coordinate depth of trim and accessories with thicknesses and number of plaster coats required.

B. Metal Accessories:

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) Alabama Metal Industries Corporation; a Gibraltar Industries company.

    b) CEMCO.

    c) Clark Western Building Systems.

    d) Dietrich Metal Framing; a Worthington Industries company.

    e) MarinoWARE.

    f) Phillips Manufacturing Co.

    g) Or Equal.

2. Foundation Weep Screed: Fabricated from hot-dip galvanized-steel sheet, ASTM A 653/A 653M, G60 (Z180) zinc coating.

3. Cornerite: Fabricated from metal lath with ASTM A 653/A 653M, G60 (Z180), hot-dip galvanized zinc coating.

4. External-Corner Reinforcement: Fabricated from metal lath with ASTM A 653/A 653M, G60 (Z180), hot-dip galvanized zinc coating.

5. Cornerbeads: Fabricated from zinc-coated (galvanized) steel.

    a) Small nose cornerbead with expanded flanges; use unless otherwise indicated.

6. Casing Beads: Fabricated from zinc-coated (galvanized) steel; square-edged style; with expanded flanges.

7. Control Joints: Fabricated from zinc-coated (galvanized) steel; one-piece-type, folded pair of unperforated screeds in M-shaped configuration; with perforated flanges and removable protective tape on plaster face of control joint.

8. Expansion Joints: Fabricated from zinc-coated (galvanized) steel; folded pair of unperforated screeds in M-shaped configuration; with expanded flanges.

2.03 MISCELLANEOUS MATERIALS

A. Water for Mixing: Potable and free of substances capable of affecting plaster set or of damaging plaster, lath, or accessories.

B. Fiber for Base Coat: Alkaline-resistant glass or polypropylene fibers, 1/2 inch (13 mm) long, free of contaminants, manufactured for use in portland cement plaster.

C. Bonding Compound: ASTM C 932.

D. Fasteners for Attaching Metal Lath to Substrates: Complying with ASTM C 1063.

E. Acoustical Sealant: As specified in Specification Section 07900, "Caulking"

2.04 PLASTER MATERIALS

A. Portland Cement: ASTM C 150, Type I.

1. Color for Base Coats: White.

B. Colorants for Job-Mixed Finish Coats: Colorfast mineral pigments that produce finish plaster color. Colors shall be selected from manufacturer's full range for Architect's selection.

C. Lime: ASTM C 206, Type S; or ASTM C 207, Type S.

D. Sand Aggregate: ASTM C 897.

1. Color for Job-Mixed Finish Coats: White.

E. Perlite Aggregate: ASTM C 35.

F. Ready-Mixed Finish-Coat Plaster: Mill-mixed portland cement, aggregates, coloring agents, and proprietary ingredients.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a) Bonsal American, an Oldcastle Company; Marblesil Stucco Mix.

b) California Stucco Products Corp.; Conventional Portland Cement Stucco.

c) El Rey Stucco Company, Inc., a brand of ParexLaHabra, Inc.; Premium Stucco Finish.

d) Florida Stucco; Florida Stucco.

e) LaHabra, a brand of ParexLaHabra, Inc.; Exterior Stucco Color Coat.

f) Omega Products International, Inc.; ColorTek Exterior Stucco.

g) Shamrock Stucco LLC; Exterior Stucco.

h) SonoWall, BASF Wall Systems, Inc.; Thoro Stucco.

i) USG Corporation; Oriental Exterior Finish Stucco.

j) Or Equal.

2. Color and Finish: Sand Finish, color to match existing.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Protect adjacent work from soiling, spattering, moisture deterioration, and other harmful effects caused by plastering.

B. Prepare solid substrates for plaster that are smooth or that do not have the suction capability required to bond with plaster according to ASTM C 926.

3.03 INSTALLING METAL LATH

A. Expanded-Metal Lath: Install according to ASTM C 1063.

1. Partition Framing and Vertical Furring: Install self furring diamond-mesh lath.

3.04 INSTALLING ACCESSORIES

A. Install according to ASTM C 1063 and at locations indicated on Drawings.

B. Reinforcement for External Corners:

1. Install lath-type, external-corner reinforcement at exterior locations.

2. Install cornerbead at interior and exterior locations.

C. Control Joints: Install control joints in specific locations approved by Architect for visual effect as follows:

1. As required to delineate plasterwork into areas (panels) of the following maximum sizes:

a) Vertical Surfaces: 144 sq. ft. (13.4 sq. m).

b) Horizontal and other Nonvertical Surfaces: 100 sq. ft. (9.3 sq. m).

3.05 PLASTER APPLICATION

A. General: Comply with ASTM C 926.

1. Do not deviate more than plus or minus 1/4 inch in 10 feet (6.4 mm in 3 m) from a true plane in finished plaster surfaces, as measured by a 10-foot (3-m) straightedge placed on surface.

2. Finish plaster flush with metal frames and other built-in metal items or accessories that act as a plaster ground unless otherwise indicated. Where casing bead does not terminate plaster at metal frame, cut base coat free from metal frame before plaster sets and groove finish coat at junctures with metal.

3. Provide plaster surfaces that are ready to receive field-applied finishes indicated.

B. Walls and Soffits; Base-Coat Mixes for Use over Metal Lath: Scratch and brown coats for three-coat plasterwork; 3/4-inch (19-mm) thickness.

C. Plaster Finish Coats:

1. Fine Sand Float, 20/30 finish.

3.06 PLASTER REPAIRS

A. Repair or replace work to eliminate cracks, dents, blisters, buckles, crazing and check cracking, dry outs, efflorescence, sweat outs, and similar defects and where bond to substrate has failed.

B. Where installing new plaster adjacent to existing condition, perform patching of damaged and deteriorated areas of run plaster, of the same type as used on existing plaster work. Texture of new work shall match and blend seamlessly with existing work.

3.07 PROTECTION

A. Remove temporary protection and enclosure of other work. Promptly remove plaster from door frames, windows, and other surfaces not indicated to be plastered. Repair floors, walls, and other surfaces stained, marred, or otherwise damaged during plastering.

END OF SECTION

SECTION 09520
ACOUSTICAL TREATMENT

PART 1 GENERAL

1.01 SCOPE.

A. This section covers acoustical treatment to be provided at locations indicated or scheduled on the drawings.

1.02 GENERAL.

A. Acoustical treatment shall be provided complete with aluminum panels, sound-absorption backing, supporting systems, trim, and all necessary appurtenances for a complete installation. The treatment shall be installed by experienced workmen in accordance with the best industry practice and the recommendations of the system manufacturer. Each area shall be permanently enclosed before the acoustical treatment is installed.

B. Painting of wall furring is covered in the Protective Coatings section.

1.03 SUBMITTALS.

A. Complete specifications, data, catalog cuts, and drawings showing the proposed layout and assembly shall be submitted in accordance with the Submittals section.

1.04 PERFORMANCE.

A. The system shall have a noise-reduction coefficient (NCR) of 1.0 or higher for the walls and ceiling when tested in accordance with ASTM C423; UL listed fire classified with flame spread 25 maximum, smoke developed 50 maximum per ASTM E84.

1.05 COLOR.

A. The aluminum panel and support angles shall be factory powder coated. Color will be selected by the City from the manufacturer's standard color chart, with one color for the interior walls.

PART 2 PRODUCTS

2.01 MATERIALS.

A. Materials shall conform to the following:

Aluminum Panels

Walls	0.0396 inch fully perforated aluminum

	panels, front and back, with 0.125 inch diameter holes, 3/8 inch staggered centers; open area of 23 percent; Industrial Acoustics Company "NF-III". Maximum lengths to minimize joints.
Sound-absorption Pads	Semi-rigid glass fiber pads, 2" inch minimum thickness, 1-1/2 lb density; dark tint
Extruded Aluminum Angle Framing	2 inch by 2 inch by 3/16 inch extruded aluminum angle, 6063-T5 alloy.
Compression posts	Manufacturer's standard.
Wall Furring System	
Furring Strips	2 inch deep, 20 gauge metal "Z" furring channels.
Ceiling	0.0396 inch fully perforated aluminum panels, front and back, with 0.125 inch diameter holes, 3/8 inch staggered centers; open area of 23 percent; Industrial Acoustics Company "NF-III". Maximum lengths to minimize joints.
Sound-absorption Pads	Semi-rigid glass fiber pads, 2" inch minimum thickness, 1-1/2 lb density; dark tint

PART 3 EXECUTION

3.01 INSTALLATION.

A. Acoustical treatment shall be installed on the walls as indicated on the drawings.

1. Walls. Wall furring shall be attached to walls at 2'-0" vertical centers by toggle bolts or expansion anchors. All anchors in exterior locations shall be galvanized. Furring strips shall be painted to match the sound-absorption pads or painted concrete block if there is no pad. Sound-absorption materials shall be applied between the furring strips as recommended by the manufacturer. Wall panels shall be attached to the furring strips

with anchors as recommended by the panel manufacturer. Wall panels shall be lapped at the vertical joint and shall be of the longest practical length to minimize horizontal joints.

2. Ceilings. Furring strips shall be installed directly roof structure. Sound-absorption materials shall be applied between the furring strips as recommended by the manufacturer. Ceiling panels shall be attached to the furring strips with anchors as recommended by the panel manufacturer. Ceiling panels shall be of the widest practical width to minimize joints.

3. Accessories. Trim shapes, closures, and other appurtenances shall be provided at all openings in the system, including doors, windows, or other penetrations.

3.02 CLEANING.

A. After erection, dirty or discolored exposed surfaces of the system shall be cleaned and left free of all defects. Any items which are damaged or which cannot be properly cleaned shall be removed and replaced.

END OF SECTION

SECTION 09701
RESINOUS FLOORING EPOXY

PART 1 GENERAL.

1.01 DESCRIPTION

A. The resinous flooring contractor shall furnish all labor, materials, tools, and equipment necessary to install a 100% solids, chemical resistant epoxy flooring in areas indicated on the drawings and/or specifications.

1.02 SUBMITTALS

A. Drawings and data shall be submitted in accordance with Specification Section 01300, "Submittals". Drawings and data shall include, but shall not be limited to, the following:

1. Product Data

2. Paint/Coating Manufacturer's data sheet for each product proposed, including statements on the suitability of the material for the intended use.

3. Technical and performance information that demonstrates compliance with the system performance and material requirements.

4. Paint/Coating Manufacturer's instructions and recommendations on surface preparation and applications.

5. Colors available for each product.

6. Material Safety Data Sheet for each product used.

7. Samples – Prior to installation the Contractor shall provide a sample of the following for approval by the Resident Engineer.

   a) Surface profile texture following shot blast.

   b) Aggregate used for slip-resistant finish

   c) Mock-up tile (12" x 12" minimum) of completed installatio

1.03 QUALITY ASSURANCE

A. Notify the Resident Engineer in writing 48 hours in advance of field operations involving surface preparation and coating application.

B. The Resident Engineer will inspect prepared surfaces. The Contractor shall not proceed with coating procedure until the surface preparation has been approved by the Resident Engineer.

C. The Resident Engineer will inspect application of all coats (primer to top coat and touch-up) applied to verify the integrity of the coating and compliance with the specifications. Each coating application will be checked and deficiencies marked. Items exhibiting an improper finish or color, or insufficient surface preparation or dry film thickness shall be prepared as necessary and corrected, utilizing the specified paint materials to obtain compliance.

PART 2 PRODUCTS.

2.01 RESINOUS FLOORING MATERIALS

A. 100% solids based, chemical resistant epoxy manufactured specific for floors.

1. Physical Properties:

   a) Bond Strength (ASTM C-882) 2110 p.s.i.

   b) Flexural Strength (ASTM C-580-68) 6,075 (7 days)

   c) Compressive Strength (ASTM D-695) 9,910

   d) Absorption (ASTM D-570) 0.6%

   e) Hardness (Shore D) 65 @ 24 Hours, 75 @ 7 days

2. Application Properties:

   a) Mix ratio 2:1 by Volume

   b) Pot life 30 minutes

   c) Cure time to walk on traffic 12 hours

   d) Cure time to truck traffic 24 hours

   e) Final cure 7 days

3. The resinous flooring system shall be resistant to spills and/or extended exposure as indicated from the following chemicals for a period of 12 months.

4. Distilled water, seawater, sulfuric acid 10%, hydrochloric acid 36%, hydrochloric vapor, sodium hydroxide 20%, diacetone alcohol, octanol, Xylene, toluene, skydol, crude oil, gasoline 98 octane, citric acid 50%, fatty acid (linseed), lactic (dairy products), carbon tetrachloride, isopropyl alcohol, methyl isobutyl carbinol, mineral spirits, detergents anionic 2%, calcium hypochlorite 5%.

B. Stain Resistance – The resinous flooring system shall be stain resistant to spills and/or extended exposure of oils, lubricants, salts, chlorine, ammonia, for 1 year.

The resinous flooring system shall provide an impermeable barrier against rising moisture.

1. Primer – Type shall be that recommended by the manufacture of resinous flooring resin. To be of the same manufacturer of the epoxy.

2. Flammability – Finished resinous flooring shall not support combustion and shall be self-extinguishing.

3. Color – Contractor shall submit actual color options to City for review and approval prior to procurement. Pigments selected shall be compatible with the resinous flooring system.

4. Fillers – Type and gradation used shall be those recommended by the manufacture of resinous flooring resin.

2.02 CONCRETE

A. The concrete on which the resinous flooring is to be installed shall be a minimum compressive strength of 3,000 psi and shall have cured at least 28 days before installation begins.

PART 3 EXECUTION.

3.01 PREPARATION OF SUBSTRATE

A. New Concrete – New concrete must be well cured and dry prior to coating. Concrete shall be allowed to cure a minimum of 28 days. No curing agents or sealing compounds should be used at any time prior to the application of the coating. A light steel trowel finish is recommended when finishing the concrete surface.

B. Any oil, grease, laitance, or other foreign material must be removed. Oil and grease shall be removed utilizing a steam clean with a strong degreaser such as tri-sodium phosphate. Laitance and other foreign material shall be removed by mechanical methods such as vacuum blasting, scarification, or grinding.

C. All new concrete floor surfaces shall be mechanically prepared by vacuum shot-blasting to achieve the surface profile selected by the City. Surface profile shall be Concrete Surface Profile (CSP) grade 2 or 3 as selected by the City. CSP's shall be in accordance with International Concrete Repair Institute (ICRI) ICRI Guideline No. 310.2R-1997, Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, Polymer Overlays and Concrete Repair.

D. Cracks in Concrete – Any cracks in the concrete shall be evaluated by the Resident Engineer. In the event that the Resident Engineer decides that it is necessary, all cracks shall be injected with an epoxy injection (non-moving cracks) or an epoxy flexible chemical grout (moving cracks), depending on whether the Resident Engineer determines the cracks to be moving or non-moving cracks.

E. In the event that the Resident Engineer decides not to inject the cracks (if any exist), Contractor shall fill the cracks with an elastic jointing compound compatible with the resinous flooring system used.

F. Before the installation of any resinous system, the surface should be examined for moisture. Test for moisture vapor transmission using ASTM F-1869 Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride. The maximum allowable rate is 3 pounds per 1,000 square feet per 24 hours.

3.02 INSTALLATION OF RESINOUS FLOORING SYSTEM

A. Resinous flooring system shall be installed at a minimum depth of 1/8-inch in strict accordance with the manufacturer's installation instructions, by an applicator trained and approved by the manufacturer.

1. Primer – Apply a coat of primer at the specific application rate recommended by the manufacturer. Any cracks in the concrete that exist at this time shall be evaluated by the Resident Engineer.

2. Base Coat – Apply a trowel coat of epoxy resin at a thickness so as to insure a total thickness of the system of not less than 1/8 inch.

3. Broadcast Coat – Broadcast surface to saturation with an aggregate that is approved by the flooring manufacturer and as selected by the City.

4. Top Coat – A top coating of epoxy shall be applied in a manner and thickness as recommended by the manufacturer.

3.03 BOND TESTING

A. Bond tests as recommended by the manufacturer of the resinous flooring system shall be conducted in order to assess the condition of the prepared substrate. No materials shall be applied without the consent of the Resident Engineer.

END OF SECTION

SECTION 09873
COLD-APPLIED PLASTIC TAPE COATING

PART 1 GENERAL

1.01 DESCRIPTION

A. This section includes materials and application of cold-applied plastic tapes on steel pipe in accordance with AWWA C209 and C214, as modified herein.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 207-10 – Steel Pipe

1.03 REFERENCE SPECIFICATION, CODES, AND STANDARDS

A. American Water Works Association

C209 Cold-Applied Tape Coatings for the Exterior of Special Sections, Connections, and Fittings for Steel Water Pipelines

C214 Tape Coating Systems for the Exterior of Steel Water Pipelines

B. National Association of Corrosion Engineers

RP-02 High voltage Electrical Inspection of Pipeline Coatings Prior to Installation

C. Steel Structures Painting Council

SP-1 Solvent Cleaning

SP-6 Commercial Blast Cleaning

1.04 QUALIFICATIONS OF MANUFACTURERS

A. Supervisors of tape coating operations shall be experienced in the application of tape and coating systems for steel pipe.

1.05 SUBMITTALS

A. Certification of test results of physical and performance characteristics of each batch of primer and each tape material specified herein.

B. Tape application procedure approved by tape manufacturer.

C. Tape application method approved by tape manufacturer to minimize voids at weld seams.

D. The names and qualifications of the workers and supervisors to be employed on the coating operation a minimum of 14 days before the start of taping operations.

E. Certification from the manufacturer that the solvent of the primer and storage primer is in compliance with air pollution control rules and regulations and all requirements of agencies and other governmental bodies having jurisdiction. Include air pollution control rules and regulations regarding the application of the primer in the manufacturer's fabrication plan.

PART 2 PRODUCTS

2.01 COLD-APPLIED PLASTIC TAPE COATING

A. Provide cold-applied plastic tape coating in accordance with AWWA C209, AWWA C214, and as specified herein. Furnish plant and field applied primer and plastic tape, and plant and field applied repair tape by a single manufacturer. Meet or exceed the physical properties of tape materials for plant and field application criteria listed when tested in accordance with the methods described in AWWA C209 and AWWA C214, Section 4.12, "Coating System Tests."

B. The tape coating systems consist of an exterior cold-applied plastic tape on the bare metal surface of steel pipe with a cement mortar coating applied over the tape system. Tape coating systems are specified for:

1. Normal plant cold-applied tape;

2. Plant cold-applied tape for special sections, connections and fittings, and plant repairs of cold-applied tape; and

3. Field joint, field coated fittings and repair of field cold-applied tape.

2.02 PRIMER

A. Primer shall be comprised of 100 percent butyl rubber with resins for adhesion, cathodic disbonding and stress corrosion cracking inhibitors. The primer shall be Polyken #1039 primer with the following properties.

1. Percent Solids: ≥ 18 percent

2. Flash Point: >+109 degrees F

3. Viscosity: Thin syrup

2.03 STORAGE PRIMER

A. Storage primer on the exposed steel at the tape cutbacks shall be Polyken #924, with the following properties.

1. Color: Black

2. Base: Synthetic natural rubber and resin

3. Solvent: Naphtha, toluene blend

4. Total Solids: 19 percent by weight

5. Viscosity: Thin syrup

6. Flash Point: >+10 degrees F

2.04 PLANT COLD-APPLIED PLASTIC TAPE SYSTEM

A. Anti-corrosion inner layer tape shall be Polyken #989, with the following properties:

1. Tape Color: Black

2. Backing: Consist of a minimum 98 percent blend of high and low density polyethylene with the remaining portion a blend of colorants and stabilizers.

3. Adhesive: Consist of a 100 percent butyl based elastomers with resins for adhesion, cathodic disbonding, and long-term in-ground performance.

4. Thickness:

   a) Total thickness: 20 mil

   b) Backing: 9 mil

   c) Adhesive: 11 mil

   d) Tolerance: minus 5percent, plus 10percent.

5. Tensile Strength at Break: ≥ 30 lb/in width

6. Elongation at Break: ≥ 200 percent

7. Adhesion to Steel: ≥ 100 oz/in width

8. Adhesion to Primed Steel: ≥ 300 oz/in width

9. Adhesion to Backing: ≥ to 40 oz/in width

10. Dielectric Strength: ≥ to 20 kV

11. Insulation Resistance: 1 x 1012 ohms

12. Water Vapor Transmission: < 0.2gm/100in2/24 hr at 70 degrees F

13. Cathodic Disbonding at 68 degrees F, for 30 days: 0.2 in2 (ASTM G8)

14. Shear Resistance at 68 degrees F for four weeks: 0.2 mm/day

15. Hydrolytic Stability, 200hrs at 98 degrees C H2O, Adhesion: > 150 oz/in

16. Thermal Stability, 2,000 hrs at 100 degrees C air, Adhesion: > 150 oz/in

B. First mechanical outer layer tape shall be Polyken # 955, with the following properties:

1. Tape Color: Gray

2. Thickness:

   a) Total thickness: 30 mil

   b) Backing: 25 mil

   c) Adhesive: 5 mil

   d) Tolerance: minus 5percent, plus 10percent.

3. Tensile Strength: ≥ 45 lb/in width

4. Elongation: ≥ 200 percent

5. Adhesion to Backing: 40 oz/in width

6. Water Vapor Transmission: < 0.2gm/100in2/24 hr at 70 degrees F

7. Dielectric Strength: ≥ 25 kV

C. Second mechanical outer layer tape shall be Polyken #956 UV1 having UV protection properties as follows. Provide certification of UV protection.

1. Tape Color: White

2. Backing: Consist of a minimum 96 percent blend of high and low density polyethylene with the remaining portion a blend of colorants and stabilizers.

3. Adhesive: Consist of a 100 percent butyl based elastomer with resins for adhesion, and long term in-ground performance.

4. Thickness:

   a) Total thickness: 30 mil

   b) Backing: 25 mil

   c) Adhesive: 5 mil

   d) Tolerance: minus 5percent, plus 10percent.

5. Tensile Strength: ≥ 55 lb/in width

6. Elongation: ≥ 200 percent

7. Adhesion to Backing: 60 oz/in width

8. Water Vapor Transmission: < 0.2gm/100in2/24 hr at 70 degrees F

9. Dielectric Strength: ≥ 25 kV

D. Total coating system shall be the Polyken YGIII system, with the following properties:

1. 100percent Polyethylene based backings with colorants and stabilizers. 100percent Butyl based elastomers.

2. Adhesion to Steel: ≥ 100 oz/in

3. Adhesion to Backing: ≥ 60 oz/in width

4. Adhesion to Primed Steel: ≥ 300 oz/in

5. Tensile Strength: ≥ 85 lb/in width

6. Elongation: > 200percent

7. Dielectric Strength: ≥ 20 kV

8. Insulation Resistance: 1 x 1012 ohms

9. Water Vapor Transmission: ≤ 0.25gm/100in2/24 hr at 70 degrees F

10. Cathodic Disbonding at 68 degrees F for 30 days: 0.2 in2 (ASTM G8)

11. Shear Resistance at 68 degrees F for 4 weeks: 0.2 mm/day

12. Impact: 90 in-lbs.

13. Penetration: 11-15percent

2.05 PLANT COLD-APPLIED PLASTIC TAPE COATINGS FOR SPECIAL SECTIONS, CONNECTIONS AND FITTINGS, AND PLANT REPAIR

A. Anti-corrosion inner layer shall be Polyken #932-50, with the following properties:

1. Backing: Consist of a minimum 96 percent blend of high and low density polyethylene with the remaining portion a blend of colorants and stabilizers.

2. Adhesive: Consist of a 100 percent butyl based elastomer with resins for adhesion, cathodic disbonding, and long-term in-ground performance.

3. Thickness:

a) Total Thickness: 50 mil

b) Backing: 40 mil

c) Adhesive: 10 mil

d) Tolerance: minus 5percent, plus 10percent.

4. Tensile Strength: ≥ 25 lb/in width

5. Elongation: ≥ 150percent

6. Adhesion to Steel: 225 oz/in width

7. Adhesion to Backing: 60 oz/in width

8. Water Vapor Transmission: < 0.2gm/100in2/24 hr at 70 degrees F

9. Dielectric Strength: ≥ 28 kV

B. Mechanical layer outer tape for plant fittings and plant repair cold-applied plastic tape shall be Polyken #955, with the following properties:

1. Backing: Consist of a minimum 96 percent blend of high and low density polyethylene with the remaining portion a blend of colorants and stabilizers.

2. Adhesive: Consist of a 100 percent butyl based elastomer with resins for adhesion, and long term in-ground performance.

3. Thickness:

a) Total thickness: 30 mil

b) Backing: 25 mil

c) Adhesive: 5 mil

d) Tolerance: minus 5percent, plus 10percent.

4. Tensile Strength: ≥ 45 lb/in width

5. Elongation: ≥ 200percent

6. Adhesion to Backing: 40 oz/in width

7. Water Vapor Transmission: < 0.2gm/100in2/24 hr at 70 degrees F

8. Dielectric Strength: ≥ 25 kv

2.06 FIELD JOINT, FIELD COATED FITTINGS, AND FIELD REPAIR COLD-APPLIED PLASTIC TAPE

A. Joint filler tape to be Polyken #939, with the following properties:

1. Tape Color: Black

2. Thickness: 125 mil

3. Elongation: > 600percent

4. Solids Content: 98percent minimum

5. Penetration Hardness: 85-105 DMM (300 GM moving load)

6. Low Temperature Flexibility: No cracking when bent around a one-inch mandrel at minus 10 degrees F

7. Chemical Resistance: No visible deterioration after 30 days immersion in the following solutions: 5percent Caustic Potash; 5percent HCL, 5percent H2SO4; Saturated HS

B. Field joint, field fitting, and field repair outer layer tape shall be Polyken #932-50, as specified herein.

PART 3 EXECUTION

3.01 COLD-APPLIED PLASTIC TAPE COATING

A. Apply plastic tape coating in accordance with AWWA C214, C209, and as modified herein.

B. Certificate of Compliance: Before shipment of pipe, furnish a certificate of compliance stating that tape materials and work furnished hereunder will comply or have complied with the requirements of these specifications and AWWA C209 and C214. The certification shall be substantiated by the tape manufacturer's production quality control test results. The tape manufacturer shall supply test data on each batch used.

C. The tape manufacturer shall furnish a representative to provide assistance during the initial application of all tape materials to ensure proper installation.

1. Retain the tape manufacturer representative for a minimum of five consecutive working days of tape coating for each project heading. At the completion of the five-day period, the tape material manufacturer's representative shall meet with the Contractor and Resident Engineer to review and update the tape coating operation plan. If, in the opinion of the Resident Engineer, significant modifications to the tape coating operations are identified in the initial five day inspection period, retain the tape material manufacturer's representative for an additional length of time, as necessary to correct all deficiencies in the application of the tape coating system.

2. The tape manufacturer representative shall be retained by the Contractor for the duration of the work and shall respond to periodic field problems and questions from the Contractor and Resident Engineer within a sufficient time period so as not to cause delay in the installation and backfill of pipe.

Costs incurred for retention of the tape manufacturer's representative shall be borne by the Contractor.

3. Properly document any modifications to the pipe manufacturer's tape coating operation and submit within three working days to the Resident Engineer in accordance with shop drawing submittal procedures.

3.02 STRAIGHT RUN PIPE APPLICATION

A. For straight run pipe, plant applied conditions, the cold-applied plastic tapes shall be a four layer system consisting of: (1) primer; (2) corrosion prevention tape (inner layer); (3) mechanical protective tape (first outer layer); and (4) mechanical protective tape (second outer layer).

B. Perform the entire coating operation as a one station operation where the pipe is supported at the ends in a manner which will permit the application of the primer, plastic tape, and cement mortar coating. Do not allow additional handling following the initial setup of the pipe section, from application of primer, tape coating, and cement mortar coating. No application involving rollers to support the pipe during the primer application, plastic tape, or cement mortar coating application will be permitted.

C. Perform the entire coating operation by experienced workers skilled in the application of cold-applied plastic tapes and cement mortar coating under qualified supervisors. The Resident Engineer is to be immediately informed of any personnel changes associated with the pipe coating operation.

D. All equipment for blasting and application of the tape coating system shall be of such design and condition to comply with all the requirements of these specifications. Immediately repair or replace equipment which, in the opinion of the Resident Engineer, does not produce the required results. Include equipment and a repair procedure for correcting defective tape application for use under this specification in the steel pipe fabrication plan. Make available for review a copy of this portion of the fabrication plan, and any updates, at the location of the coating operation, and a repair procedure for correcting defective tape application.

E. Remove the exterior weld bead along the entire exterior surface of the pipe. The exterior weld bead shall be flush with the exterior surface of the pipe with a tolerance of plus 1/64 inch. Removal of the weld bead is to be conducted in such a manner that no gouging or nicking of the plate surface will occur. This operation is to result in a smooth exterior surface with no ridges or valleys which may result in bridging or disbonding of the tape from the surface of the pipe.

F. Surface preparation shall conform to AWWA C214 and the following.

1. Bare pipe shall be clean of all foreign matter such as mud, mill lacquer, wax, coal tar, asphalt, oil, grease, or any contaminants. Wash off any chemical solutions used in cutting or welding with hot water and allow the surface to dry. Remove welding slag or scale from all welds by wire-

brushing, hammering, or other satisfactory means. Remove welding splash globules before priming.

2. Before blast cleaning, inspect surfaces and, if required, preclean in accordance with the requirements of SSPC SP-1, Solvent Cleaning, to remove oil, grease, and all foreign deposits. Remove visible oil and grease spots by solvent wiping. Use only approved solvents that do not leave any residue. Include in the -manufacturer's fabrication plan the cleaning solvent applications procedure and safety precautions. Preheating to remove oil, grease, and mill scale will be permitted; provided, that the pipe is to be cement mortar lined in the field; and provided, all pipe is preheated in a uniform manner to avoid distortion. Do not exceed preheat temperatures of 500 degrees Fahrenheit.

3. Use on all affected steel-plate work, suitable and effective measures for eliminating the inclusion of gas forming elements, or other detrimental conditions, in any of the shop or field welds which results in any condition found to be detrimental to the successful application and bonding of primer, plastic tape, and cement mortar coating. Said measures to include time-curing the pipe sufficiently, thoroughly neutralizing the gas forming elements, or other approved treatment.

G. Blast cleaning shall conform to AWWA C214 and the following.

1. Blast the pipe surface using a commercially available shot grit mixture to achieve a prepared surface equal to that which is specified in SSPC SP-6, Commercial Blast Cleaning.

2. For plant mortar-lined pipe, perform blast cleaning of said exterior surfaces after the initial curing of the spun mortar lining. Perform the exterior blast cleaning in such a manner as not to endanger the mortar lining in the pipe. Completely remove corrosion and foreign substances from the exterior of the pipe in the blastcleaning operation, and apply primer immediately after completion of blast cleaning.

3. The shot grit mixture shall not exceed 40 percent shot to 60 percent grit. The shot grit mixture is to be determined before the start of blast cleaning operations and this mixture ratio is not to be modified throughout the duration of the blast cleaning operations without the written approval of the Resident Engineer.

4. Achieve from abrasive blasting an anchor pattern profile a minimum of 1.0 mil, but not exceeding 2.0 mils. Provide anchor pattern standards in the form of a three-dimensional standard plate which depicts a commercial blast profile. Prepare a sample of the blasted surface on a representative steel plate measuring six inches by six inches by 1/4 inch or purchase standard industry plate samples of various blast finishes for comparisons. Purchase standard plates from NACE, meeting NACE TM-01-75, and conforming to NACE No. 3 standard using grit. Establish by agreement with the Resident Engineer the visual standards that meet the specified anchor

pattern and degree of cleanliness. Upon the establishment of the said standards, seal the steel plate using a clear acrylic coating, moisture proof plastic bag, or other approved means to protect the plate from surface contamination or corrosion. Use this plate as a visual comparator during the blastcleaning and coating operations. Measure the anchor pattern or profile of the blasted surface using comparator tape as specified herein.

5. Inspect the blast cleaned exterior pipe surface for adequate surface preparation before application of the primer. Surface comparator tapes are to be used by the manufacture in at least eight random areas, selected by the Resident Engineer, along any given 40-foot length of pipe. The results of the surface comparator tapes are to be documented on the quality control sheet for each pipe section.

6. Coat each pipe section with primer and tape within the same day of being blast cleaned. Do not allow blasted and/or blasted and primed pipe to sit overnight. All blasted and primed pipe must be coated by the end of the day. No coating will be permitted on pipe sections showing evidence of rust.

H. Primer application shall conform to AWWA C214 and the following.

1. Before primer application, clean the pipe surface free of foreign matter such as sand, grease, oil, grit, rust particles, and dirt.

2. Apply the primer in a uniform thin film at the coverage rate recommended by the manufacturer. Meet the recommendations of the manufacturer for the state of dryness of the primer before the application of the inner layer of tape. Make available at all times, primed surfaces for inspection before the application of the inner layer tape. Maintain adequate safety precautions, as outlined in the manufacturer's fabrication plan, throughout the application of the primer.

3. Limit the application of primer to that length of pipe which can be taped within the same work day. Pipe coated with primer which was not taped within the same work day shall be rejected at the discretion of the Resident Engineer. The primer shall be removed and the surface shall be reprimed.

4. Protect primer coated pipe sections from moisture, dirt, sand, and other potentially contaminating materials. Protect priming operations from, or suspended during, times of high wind. Sections not adequately protected will be rejected by the Resident Engineer. If rejection occurs due to contamination of the primer, completely remove the primer from the exterior of the pipe section and reprime the surface.

5. Thoroughly mix the primer by agitation using Jiffy Mixer or an equal powered by air or explosion proof electric motor. Continuously mix and agitate primer during application to prevent settling or lumping.

6. Apply primer only to a dry pipe surface. Whenever the ambient air temperatures are cold enough to cause gelling of the primer, the use of heaters will not be permitted to return the primer back to a fully liquid state. Use new primer at a minimum of 40 degrees F.

7. Apply storage primer to the exposed steel pipe at tape cutbacks to prevent oxidation of the cleaned metal surface. Spray apply minimum of 1-1/2 mils and maximum of 2-1/2 mils of storage primer to exposed steel per the manufacturer's recommendations. Do not place storage primer on the edge of the steel plate.

I. Inner layer tape application:

1. Apply the inner layer tape directly onto the primed surface using approved mechanical dispensing equipment to assure adequate, consistent tension on the tape as recommended by the tape manufacturer. Use rollers to apply pressure on the tape as it comes in contact with the pipe. Make necessary adjustments to mechanical application equipment to assure a uniform, tight coating. Maintain a tight, smooth, mechanically induced, wrinkle-free coating throughout application process.

2. The application of tension shall be such that the width of tape will be reduced between 1-1/2 to 2 percent of tape width before the pull. Provide a pressure readout gauge and chart recorder, suitable to the Resident Engineer, with the tape let-off machine to document the tape tension during application.

3. Apply inner layer tape at a minimum roll temperature of 70 degrees F. Continuously monitor the temperature of the tape within 12 inches of the point of contact with the pipe surface. Use a chart recorder, suitable to the Resident Engineer, to document the temperature of the tape during application. Sections where the tape application tension and temperature is not maintained within manufacturer's recommendations shall be rejected, and the tape removed from the entire pipe section and reapplied.

4. Continuously electronically test the inner tape layer at 6,000 volts immediately following application of the tape by a holiday tester permanently mounted to the tape application station and equipped with an indicator light and audio buzzer, suitable to the Resident Engineer to alert the workmen of the presence of holidays in the coating system.

5. Spirally wrap the inner layer tape over longitudinally welded pipe; however, for spiral welded pipe, the angle of the inner layer tape shall be wrapped as parallel as practicable to the spiral weld of the pipe or as approved by the Resident Engineer. Provide a one inch nominal tape overlap, minimum overlap ¾ inch.

6. Splice each new roll by overlapping the new tape over the end of the preceding roll by at least six inches. Perform this end lap splice by hand or by a mechanical applicator such that the splice is wrinkle free and

maintains the continuity of the inner wrap coating. Maintain the wrapping angle of the new roll parallel to that of the previous roll.

7. Provide cutbacks ten inches from and parallel to the end of the pipe. Perform cutbacks using a cutting device that is guided from the end of the pipe to insure a uniform, straight cutback.

J. Mechanical outer layer tape application:

1. Apply the first mechanical outer layer of tape over the inner layer tape using the same type of mechanical equipment used in the application of the inner layer tape. No overlap splice of the other layer coinciding with the overlap splice of the inner layer will be permitted. Provide a minimum six-inch separation between overlap of splices. Apply two mechanical outer layers of tape as specified herein. The inner layer tape shall be electrically tested, inspected, and approved before the application of the first mechanical outer layer tape and the first mechanical outer layer tape shall also be visually inspected and approved before the application of the second mechanical outer layer tape. Ensure that both mechanical outer layer tapes are smooth, tight, and wrinkle-free.

2. Apply mechanical outer layer tapes in accordance with the requirements for the inner layer tape, except that the minimum tape roll application temperature shall be 90 degrees F. Monitoring for tension and temperature will be required for the mechanical outer layer tapes. The use of rollers to apply pressure on the tape is not required during application of the mechanical outer layer tapes. Holiday testing of the mechanical outer layer tapes is not required during tape application. Test the complete tape system before coating as specified herein.

K. Storage primer application shall conform to AWWA C214 as modified herein:

1. Before storage primer application, clean the pipe surface free from foreign matter such as sand, grease, oil, grit, rust particles, and dirt.

2. Thoroughly mix the primer by agitation using Jiffy Mixer or an equal powered by air or explosion proof electric motor. Continuously mix and agitate primer during application to prevent settling or lumping.

3. Apply primer only to a dry pipe surface. Whenever the ambient air temperatures are cold enough to cause gelling of the primer, the use of heaters will not be permitted to return the primer back to a fully liquid state. Use new primer at a minimum of 40 degrees F.

4. Apply storage primer to the exposed steel pipe at tape cutbacks to prevent oxidation of the cleaned metal surface. Spray apply minimum of 1-1/2 mils and maximum of 2-1/2 mils of storage primer to exposed steel per the manufacturer's recommendations. Do not place storage primer on the edge of the steel plate.

5. Certify the solvent of the primer and storage primer by the manufacturer stating compliance with air pollution control rules and regulations and all requirements of agencies and other governmental bodies having jurisdiction. Include air pollution control rules and regulations regarding the application of the primer in the manufacturer's fabrication plan.

3.03 FITTINGS COATED AT THE PLANT

A. Coat fittings which cannot be machine coated in accordance with AWWA C209 using materials as specified herein. Weld bead preparation, surface preparation, blast cleaning, primer and tape application shall be as specified for straight run pipe. Apply an inner layer tape of Polyken # 932-50 with a one-inch nominal, 3/4-inch minimum, tape overlap on all plant coated fittings. Apply an outer layer of cold-applied plastic tape as specified herein with a 55 percent overlap on all plant coated fittings. Provide a minimum thickness of 110 mils for the total tape coat system for plant coated fittings.

B. When more than 30 percent of the tape coating is removed from the circumference of the pipe for the installation of fittings, remove the tape coating system remaining on the pipe. Reprime and retape the fitting and pipe in accordance with these specifications.

C. Test all completed tape coated fittings in the presence of the Resident Engineer with an electrical flaw detector before installation of cement mortar coating. Applied voltage shall be in the range of 11,000 to 15,000 volts. Repair any holidays found.

D. Follow the procedure described herein for tape coating repair for fittings and field joints. Repair cement mortar coating defects in accordance with these specifications.

E. Apply cement mortar coating over the tape coated fittings immediately after completion of tape coating, testing, and inspections.

3.04 COATING OF FIELD JOINTS

A. Field cold-applied plastic tape coating shall be in accordance with AWWA C209, as modified herein.

B. Before welding any field joints, wrap an 18 inch strip of heat resistant material over the entire coated pipe sections on each side of the joint to be welded to avoid damage to the plant applied coating by the hot weld spatter. Do not use the coated portion of the pipe for grounding.

C. Immediately before exterior welding of the pipe for double welded lap joints, remove storage primer and wire brush area to be welded per the manufacturer's recommendations.

D. No tape coating will be permitted until the welding has been completed and the pipe section has cooled sufficiently so as not to damage the integrity of the tape coating system.

E. Do not permit trapped air under the tape in the joint.

F. After joint welding, remove flash rusting by mechanical means such as a wire brush. Wire brush the weld, storage primed steel and all exposed steel. Remove all burrs and weld slags to achieve a smooth surface.

G. Clean the pipe surface free of mud, mill lacquer, wax, tar, grease, or any foreign matter. Remove visible oil or grease using an approved solvent that will not leave any residue on the pipe surface. The pipe surface shall be free of any moisture and all foreign matter before the application of primer.

H. Before the application of the field applied tape coating, test the plant applied tape coating in the presence of the Resident Engineer with an electrical flaw detector. Repair all holidays and physical damage to the plant applied tape coating before application of the field applied tape coating.

I. Pack irregularities in joint with elastomeric joint filler.

J. Apply primer by brush or roller (four mil wet, one mil dry).

K. After primer has dried, apply tape to the joint and extend a minimum of three inches onto the mill coat. End splices shall be a minimum of six inches and shall be staggered. The tape coating shall overlap at least three inches on the adjacent tape wrap. Maintain 55 percent overlap on all field joint tape to produce a minimum thickness of 100 mils.

L. Apply tape with sufficient tension to conform to the surface irregularities. The finished wrap shall produce a smooth, wrinkle-free surface.

M. Test the final applied tape coating in the presence of the Resident Engineer with an electrical flaw detector. Repair all holidays and physical damage to the final applied tape coating before application of the mortar coating.

N. Apply mortar coating over the tape coated joint immediately upon completion of tape wrapping, testing, and inspections.

3.05 INSPECTION OF TAPE COATING

A. Perform all coating work in the presence of the Resident Engineer. Any coatings applied in the absence of the Resident Engineer may be rejected.

1. Provide the Resident Engineer with reasonable facilities and space, at the Contractor's expense, for the inspection, testing, and obtaining of any information required to determine the characteristics of the material to be used. Furnish to the Resident Engineer at least two electrical pipe coating flaw detectors at the plant, and one electrical pipe coating flaw detector per pipe installation heading in the field, to aid in the inspection of the tape coating.

2. Provide free access to the Resident Engineer to plants of the manufacturer furnishing the materials and to the worksite.

B. Holiday detection for tape coating:

1. Before the application of the mechanical outer layer tapes, electrically test the inner layer tape for any flaws in the coating with a suitable holiday detector as approved by the Resident Engineer. Test the total tape coating system a second time immediately before installing cement mortar coating. The detector for both tests shall impress a voltage conforming to NACE Standard RP-02. The voltage to be used to electrically test the tape shall be included in the manufacturer's fabrication plan.

2. Clearly mark all holidays electrically or otherwise detected, due to flaws, or mishaps, upon discovery, and immediately repair. Discontinue wrapping of the first mechanical outer layer tape of any pipe section until the detected holiday has been repaired. Perform repairs using methods specified herein. After the repair, retest the affected areas with the holiday detector before the application of the outer layer wrap. This process will be done until the coating has successfully passed the test.

3.06 TAPE COATING REPAIRS

A. Furnish and install plant and field cold-applied plastic repair tapes in accordance with AWWA C209 using plant and field tape materials as specified herein. Provide the cold-applied plastic repair tapes from the same manufacturer as the plant applied plastic tape manufacturer. Repair tapes and primer shall be completely compatible with the tape system used for straight run pipe.

B. Repair any damage in the form of holidays, flaws or mishaps found in the total coating system by removing the outer layer tapes and inner layer tape from the damaged area of the pipe. Thoroughly clean the damaged area using methods and materials approved by the Resident Engineer. The methods and materials to be used in repairing the damaged areas will depend on the type and cause of damage. After cleaning, apply a suitable primer, followed by a patch of repair tape over the affected area. Overlap the patch repair tape over the undamaged coating a minimum of four inches in all directions. Retest the repaired area with a holiday detector. Wrap an outer layer tape over the repaired area. The outer layer tape shall be the same material as the "Second Mechanical Outer Layer Tape" as specified herein. Overlap by a minimum six inches past the repair tape area. At the discretion of the Resident Engineer, depending on the extent of the repair area, wrap the outer layer tape around the entire circumference of the pipe.

C. If the outer layer tapes are damaged and holidays or other flaws are not detected in the inner layer tape at the same area, the repair of the inner layer tape may not be necessary; however, if the damage is determined by the Resident Engineer, to be severe enough to jeopardize the integrity of the inner layer tape, the Resident Engineer will direct the Contractor to repair the inner layer tape. If such action is taken, remove the outer layer tapes up to the boundaries of the damaged area, taking care not to damage the inner layer tape any further. Before replacing the

outer layer tapes, apply a holiday detector to the inner layer tape to determine that no damage has been made to this primary tape coating during the outer layer removal process. Perform the repair of the outer layer tapes in accordance with the requirements as described above. Overlap the repair tape over the undamaged coating a minimum of four inches in all directions.

D. When the repair area tests showing no holiday, apply a notation to the area indicating the test is satisfactory. Apply cement mortar coating over the cold-applied plastic tape coating.

3.07 PROTECTING COATED PIPE

A. Protect all coated surfaces from damage before and during the pipe installation in accordance with these specifications. At the fabrication plant, handle the coated pipe sections only after application of the cement mortar coating using belt slings or padded forklifts.

B. In transporting the coated pipe, rest the pipe in saddles not less than 36 inches wide shaped to the outside diameter of the coated pipe. The saddles shall be in contact with the bottom of the pipe along an arc of at least 60 degrees. Completely line saddles with not less than 5/8-inch-thick rubber belting. This belting shall overlap the edges of the saddles not less than three inches. No nails nor any other fasteners that may damage the coated pipe will be permitted in installing the rubber belting on saddles. Any damaged pipe and coatings will be rejected. Rejected pipe may be repaired and retested when in the judgment of the Resident Engineer an acceptable repair can be achieved.

C. Apply a storage wrap to the exposed tape ends to protect against ultraviolet exposure. Remove the storage wrap before completing the field joint. Any tape coated pipe, including exposed tape ends at the cement mortar hold-backs, subjected to ultraviolet exposure longer than 90 calendar days before installing cement mortar coating shall be physically inspected by the Resident Engineer before installation of plant or field applied cement mortar coating. Ultraviolet degradation will not be accepted; except that if in the opinion of the Resident Engineer, the degree of degradation will not affect the integrity of the coating.

END OF SECTION

SECTION 09900
PAINTING AND COATING

PART 1 GENERAL

1.01 DESCRIPTION

A. This section includes materials and application of painting and coating systems for the following surfaces:

1. Submerged metal.
2. Exposed metal.
3. Buried metal.
4. Metal in contact with concrete.
5. Architectural Coatings and Finishes

B. Contractor to coordinate top finish coat of all piping, valves and appurtenances with City to ensure all materials and color is consistent.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 03300 - Cast-in-Place Concrete

B. Section 09873 - Cold Applied Plastic Tape Coating

C. Section 09961 - Fusion-Bonded Epoxy Linings and Coatings

1.03 REFERENCE SPECIFICATIONS

A. American Water Works Association

C105 Polyethylene Encasement for Ductile Iron Pipe Systems.

C222 Polyurethane Coatings for the Interior and Exterior of Steel Water Pipelines.

C210 Liquid Epoxy Coating Systems for Interior and Exterior of Steel Pipelines

B. National Sanitation Foundation

NSF-61 Drinking Water System Components Health Effects.

C. The Society for Protective Coatings

SSPC PA-1, Shop, Field, and Maintenance Painting

SSPC-PA 2, Procedure for Determining Conformance to Dry Coating Thickness Requirements

SSPC PA-3, Guide to Safety in Paint Application

SSPC SP-1, Solvent Cleaning

SSPC SP-2, Hand Tool Cleaning

SSPC SP-3. Power Tool Cleaning

SSPC SP-5, White Metal Blast Cleaning

SSPC SP-6, Commercial Blast Cleaning

SSPC SP-10, Near White Metal Blast Cleaning

SSPC SP-11, Power Tool Cleaning to Bare Metal

D. National Association of Corrosion Engineers (NACE)

NACE SPO 188, Discontinuity (Holiday) Testing of Protective Coatings

NACE RP0274, High-Voltage Electrical Inspection of Pipeline Coatings Prior to Installation

1.04 SUBMITTALS

A. Submit shop drawings in accordance with the General Conditions and Specification Section 01300, "Submittals".

B. Submit separately manufacturer's data sheets for each product proposed for the Pump Station and vault piping showing the following information:

1. Percent solids by volume.

2. Minimum and maximum recommended dry-film thickness per coat for prime, intermediate, and finish coats.

3. Recommended surface preparation.

4. Recommended thinners.

5. Statement verifying that the specified prime coat is recommended by the manufacturer for use with the specified intermediate and finish coats.

6. Application instructions including recommended equipment and temperature limitations.

7. Curing requirements and instructions.

C. Submit color swatches.

D. Submit certificate identifying the type and gradation of abrasives used for surface preparation.

1. Abrasive blast media shall be in compliance with federal, state and local regulations, including Title 17 California Code of Regulations, Sections 92000-92530; Abrasive Blasting. Abrasives used for dry unconfined abrasive blasting are to have current certification by the California Air Resources Board (CARB). When applicable provide the following information for all abrasives to be used for dry unconfined abrasive blasting:

a) The manufacturer's name or identifiable trade name.

b) The grade or brand name of the abrasive.

c) Verification that the abrasives are CARB certified for unconfined blasting.

E. Submit material safety data sheets for each coating.

F. Certification that all paints and coatings comply with San Diego Air Pollution Control City requirements.

G. Coatings Schedule: At least 30 working days prior to the start of shop or Project site coating work, the Contractor shall submit a schedule of coating products to be used. The list shall indicate the manufacturer's brand name of each material to be used and the surfaces to which each material is to be applied and the method of holiday testing.

H. Submit application procedures and Quality Assurance inspection plan with hold points for the application of applied coating in the shop and for field-applied coating on joints.

I. The Contractor shall provide a NACE Certified CIP Level III Peer Reviewed Coating Inspector (NACE Level III Coating Inspector), from the beginning of surface preparation to the coating application to the final curing and inspection. The NACE Level III Coating Inspector shall provide instruction, guidance, and inspection to the Contractor for all aspects of surface preparation, coating application, final coating inspection including repair and/or touch up.

1. Submit Name and Certification Number of the NACE Level III Coating Inspector.

J. Inspection Reports and Records: All reports for painting and coating shall be signed by the NACE Level III Coating Inspector certifying compliance with Contract documents. Inspection reports for shop and field applied coatings shall be submitted within 2 days after the Work has been performed.

K. Qualifications: The Contractor shall submit a list of names and **for City review and approval** for each supervisor and individual worker performing application and mixing. Workers whose qualifications have not been submitted, reviewed, and approved by City shall not be authorized to apply, mix, or supervise application of coating systems.

1. The Contractor shall employ trained, experienced applicators, trained (NACE or SSPC) and certified quality control inspectors, and trained coating mixer/helpers.

2. These workers shall work under the direction of qualified and experienced supervisors.

3. Supervisors shall have experience supervising industrial maintenance coating application-operations similar to the operations required to complete this Project.

4. Applicators and mixer-helpers shall be trained and certified by the coating manufacturer for all coating products used on this Project.

5. Applicators shall have experience applying the industrial maintenance coatings products used on this Project.

1.05 DELIVERY, STORAGE, AND HANDLING

A. All materials shall be in the original sealed containers. They shall not be opened or used until Engineer has physically inspected contents and obtained necessary data from information printed on containers or label. Materials exceeding storage life recommended by the manufacturer shall be rejected.

B. All coating materials shall be stored in enclosed structures to protect them from weather and excessive heat or cold. At all times coatings shall be stored at a temperature between 50° F and 100° F, in a well-ventilated area. The Contractor shall take measures to prevent any fire hazards associated with storage of the materials.

1.06 SAFETY METHODS

A. All safety methods in surface preparation and painting application shall be in accordance with California Code of Regulations, Title 8 and the guidelines and safety requirements of the MSDS for each product.

B. Ventilation equipment, respirators, and other safety devices shall be used for the protection of personnel as required by authorities having jurisdiction and as recommended by the paint manufacturer.

1.07 EQUIPMENT AND TOOLS

A. Compressed-air units used in cleaning, abrasive blasting, and painting shall be equipped with oil and water separators. Separators shall be placed as close as practical to the application equipment.

B. Application equipment shall be thoroughly cleaned whenever changing the type of paint or color.

1.08 QUALITY ASSURANCE

A. General: Quality assurance procedures and practices shall be utilized to monitor all phases of Project. Procedures or practices not specifically defined herein may be utilized provided they meet recognized and acceptable professional standards and are approved by the Engineer.

B. All materials furnished and all Work accomplished under the Contract shall be subject to inspection by the Engineer. The Contractor shall be held strictly to the true intent of the Specifications in regard to quality of materials, workmanship, and diligent execution of the Contract.

C. The Contractors NACE Level III Coating Inspector shall provide, to the Engineer, daily project progress reports which include the type of coating Work conducted and significant coatings preparation and application data to include, but not limited to, ambient temperature, surface temperature, relative humidity, dew point, anchor profile, coatings mixture, DFT, coating adhesion, Holiday testing, and coating cure.

1. The NACE Level III Coating Inspector's shall ensure that coated surfaces are properly prepared and that the coating is applied per the manufacturer's recommendations and verification statement that all work is in compliance with Contract.

D. Work accomplished in the absence of prescribed inspection may be required to be removed and replaced under the proper inspection, and the entire cost of removal and replacement, including the cost of all materials used in the Work thus removed, shall be borne by the Contractor, regardless of whether the Work removed is found to be defective or not.

E. Thickness Testing: Thickness of coatings and paints shall be tested with a non-destructive film thickness gauge. An instrument such as a Tooke Gage should be used if a destructive tester is deemed necessary. Testing shall be accomplished in conformance to SSPC-PA 2, "Measurement of Dry Paint Thickness with Magnetic Gages" except as modified hereinafter.

F. Holiday Testing: Coating integrity of all coated surfaces shall be Holiday tested with an approved inspection device and in accordance with NACE SPO 188-2006. Testing shall be performed in the presence of the NACE Level III Coating Inspector and the Engineer. All holidays shall be marked, repaired in accordance with the manufacturer's printed recommendations and retested. The final coating shall be 100% Holiday-free with no pinholes or other irregularities.

G. Inspection Devices: Contractor shall furnish, until final acceptance of coatings and paints, inspection devices in good working condition for detection of holidays and measurement of dry-film thickness. They 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 the presence of the Engineer with location and frequency basis determined by the Engineer. The Engineer is not precluded from furnishing his own inspection devices and rendering decisions based solely upon results of tests using those devices.

H. Acceptable Inspection Devices: Acceptable devices for ferrous metal surfaces include, but are not limited to Tinker and Rasor Models AP and AP-W holiday detectors, or equivalent and or "Positest", or "Positector" or "Quanix" units or equivalent for dry film thickness gauging. Inspection devices shall be operated in accordance with these specifications and the manufacturer's instructions.

I. Dehumidification: Dehumidification equipment or other alternate ventilation systems must be approved by the NACE Level III Coating Inspector. Equipment must be operated on a continuous basis during all blasting, coating and curing operations, including shifts during which no Work is being accomplished.

J. Material containers not bearing the original manufacturer applied contents label shall be rejected and shall be immediately removed from the Project site/work area

PART 2 MATERIALS

2.01 PAINTING AND COATING SYSTEMS

A. The following index lists the various painting and coating systems by service and generic type:

PAINT COATINGS SYSTEM INDEX

No.	Title	Generic Coating
Submerged Metal Coating Systems		
7.	Submerged Metal, Potable Water	Epoxy
Exposed or Submerged Metal Coating Systems		
10.	Sunlight Exposed Metal, Corrosive Environment	High-build epoxy
11.	Exposed Metal, Corrosive Environment	High-build epoxy
15.	Sunlight Exposed Metal, Atmospheric Weathering or Water Condensation Environment	Acrylic – Solvent Borne Enamel
Buried Metal Coating Systems		
25.	Buried Metal Piping and Tubing	Coal-tar, wax, and polyethylene tape wrap or extruded polyethylene

No.	Title	Generic Coating
Coating Systems for Nonferrous Metals		
52.	Exposed Metal, Galvanized Steel	Synthetic resin
54.	Aluminum Insulation from Concrete and Carbon Steel	Epoxy
55.	Repair of Galvanized Surfaces	Cold galvanizing compound
Architectural Coatings and Finishes		
73	Clear Sealer on Exterior Concrete and Masonry	Silane Sealer
81.	Semi-Gloss Finish on Concrete, Masonry, or Plaster	Vinyl acrylic - Latex
85.	Semi-Gloss Finish on Metal	Acrylic – Solvent Borne Enamel

B. These systems are specified in detail in the following paragraphs. For each coating, the required surface preparation, prime coat, intermediate coat (if required), topcoat, and coating thicknesses are described. Mil thicknesses shown are minimum dry-film thicknesses.

C. Contractor shall use products of same manufacturer for each painting and coating system. Prior to field applications, the Contractor shall verify that paintings and coatings are compatible with shop applied primers.

D. All materials used herein that will be in contact with potable water shall be NSF 61 compliant.

2.02 SUBMERGED METAL COATING SYSTEMS

A. System No. 7--Submerged Metal, Potable Water:

1. Type: Epoxy.

2. Service Conditions: For use with structures, valves, piping, or equipment immersed in water.

3. Surface Preparation: SSPC SP-10.

4. Coating System: Apply the manufacturer's recommended number of coats to attain the specified minimum coating thickness. Products: Devoe Bar-Rust 233H, Tnemec N140 or 100, Sherwin-Williams Tank Clad HS B62-80, PPG AQUAPON® LT NSF Low Temperature Epoxy Coatings 95-172, Carboline Carboguard 891, Ameron 395, International Interline 785HS, Carboline Plasite 7133 or 9133, Keysite 740, Scotchkote 306, or equal; 16 mils total. Color of topcoat: white. Each coat shall be different color than the one preceding it.

a) To insure complete coverage of all surfaces, all welds, sharp edges, nuts, bolts, and irregular surfaces difficult to coat or paint shall

receive a stripe brush coat of the specified material prior to application of each complete coat.

2.03 EXPOSED METAL COATING SYSTEMS

A. System No. 10—Sunlight Exposed Metal, Corrosive Environment:

1. Type: High-build epoxy finish coat having a minimum volume solids of 80%.

2. Service Conditions: For use with sunlight exposed metal structures or pipes subjected to water condensation; chemical fumes and chemical contact.

3. Surface Preparation: SSPC SP-10.

4. Prime, Intermediate, & Finish Coats: Engard 428 Chemical Resistant Urethane, Amerlock 400, Tnemec 104, ICI Devoe Devran 224HS or 231, International Interseal 670HS, Ameron 385, Carboline Carboguard 890, Sherwin-Williams Macropoxy 646 B58-600, PPG PITT-GUARD® Direct-to-Rust Epoxy Mastic Coating 97-145 series, or equal; 5 mils each coat (15 mils total).

5. To insure complete coverage of all surfaces, all welds, sharp edges, nuts, bolts, and irregular surfaces difficult to coat or paint shall receive a stripe brush coat of the specified material prior to application of each complete coat.

6. Top finish coat shall be two coats of Acrylic semi-gloss enamel, 3 mils dry each, Ellis 4400 Solvent Borne Enamel, Dunn-Edwards, color "Ford Safety Blue" per System No. 85.

B. System No. 11 - Exposed Metal, Corrosive Environment

1. Type: A zinc prime coat with a high-build epoxy intermediate coat and high build epoxy topcoat.

2. Service Conditions: For use with metal structures or pipes subjected to water condensation; chemical fumes, such as hydrogen sulfide; salt spray; and chemical contact.

3. Surface Preparation: SSPC-10.

4. Prime Coat: Zinc-rich primer recommended by the manufacturer for overcoating with a high-build epoxy finish coat. Minimum zinc content shall be 17 pounds per gallon or 81% by weight in dried film. Apply to a thickness of 3.0 mils. Products shall be Tnemec 94-H2O Hydro-Zinc, Carboline Carbozinc 859 VOC , Ameron Amercoat 68HS VOC, or equal. Color to be red, gray or green.

5. Intermediate Coat: Tnemec 66HS Epoxoline, Carboline 890 VOC, Ameron Amercoat 385, or equal. Apply to a thickness of 4.0 to 6.0 mils DFT.

6. Finish Coat: Tnemec 66HS Epoxoline, Carboline 890 VOC, Ameron Amercoat 385, or equal. Apply to a thickness of 4.0 to 6.0 mils DFT. Color to be as specified herein for the indicated water type.

C. System No. 15--Exposed Metal, Atmospheric Weathering or Water Condensation Environment:

1. Type: One component acrylic or solvent borne enamel having a minimum volume solids content of 35% with an acrylic primer.

2. Service Conditions: For use on interior and exterior metal and piping subject to sunlight, weathering, humidity, or water condensation.

3. Surface Preparation: SSPC SP-6.

4. Prime Coat: Ellis 680 Series Solvent Borne Primers, Sherwin-Williams Pro-Cryl Universal Primer, ICI Devoe Devflex 4020DTM water-borne primer, Carboline 3358, Tnemec Series 115, or equal applied to a minimum dry-film thickness of 3 mils.

5. Finish Coats: Two or more coats of Ellis 4400, Sherwin-Williams Sher-Cryl B66–300, ICI Devoe Devflex 659, Carboline 3359 or 3359DTM, Tnemec Series 1028, or equal. Apply sufficient coats to provide a total minimum dry-film thickness of 8 mils. Thickness of any individual coat shall not exceed 4 mils.

6. Top finish coat shall be two coats of Acrylic semi-gloss enamel, 3 mils dry each, Ellis 4400 Solvent Borne Enamel, Dunn-Edwards, color "Ford Safety Blue" per System No. 85.

2.04 BURIED METAL COATING SYSTEMS

A. System No. 25--Buried Metal Piping and Tubing:

1. Type: Microcrystalline wax tape, cold-applied coal-tar tape, or hot-applied coal-tar tape.

2. Service Conditions: Buried ferrous and nonferrous piping and tubing.

3. Coat with one of the following systems:

a) Wrap with microcrystalline wax tape. Apply tape with manufacturer's recommended prime coat. Tape shall be Trenton Wax Tape or City approved equal.

b) Wrap with cold-applied coal-tar tape conforming to AWWA C209. Minimum thickness of tape shall be 35 mils. Apply tape with manufacturer's prime coat. Tape shall be Tapecoat CT, Protecto-Wrap 200, or equal.

c) Wrap with hot-applied coal-tar tape conforming to AWWA C203, Section 4.6. Minimum thickness of tape shall be 50 mils. Apply tape with manufacturer's recommended prime coat. Tape shall be Tapecoat 20, Protecto-Wrap 110, or equal.

4. Use chloride-free primers with the above coatings when applying to stainless steel piping or tubing.

5. Coat field joints of buried piping that has a shop-applied coating with primer and tape conforming to AWWA C209. Use Type 1 tape of 35-mil thickness. Products: Protection Engineering Co. Protectowrap 200 GT, Tapecoat CT10/40W, Polyken 930-35, or equal.

6. Perform electrical inspection of shop and field coating in accordance with Section 5 of AWWA C209.

7. Install buried pipes with wrapped coatings by extending the wrapping to the first joint after entering a building, penetrating a slab, or 6 inches above finished grade. Wrap joints spirally with a minimum overlap of 50% of the tape width.

2.05 COATING SYSTEMS FOR NONFERROUS METALS

A. System No. 52--Exposed Metal, Galvanized Steel:

1. Type: Synthetic resin or epoxy primer.

2. Service Conditions: Coat galvanized steel surfaces with this system before applying topcoat.

3. Surface Preparation of Galvanized Steel: Surfaces shall be flat with no protrusions. Remove high spots and tears in the galvanizing with hand and power grinders. Comply with ASTM D6386, paragraph 5.2.1. Do not remove the galvanized coating below the specified thickness. Solvent clean galvanized surfaces per ASTM D6386, paragraph 5.3.2. Then sweep blast per ASTM D6386, paragraph 5.4.1. Use one of the abrasive materials that is described in ASTM D6386, paragraph 5.4.1. Surface preparation for weathered and partially weathered galvanized steel shall be in accordance with ASTM D6386, paragraphs 6 and 7. Apply prime coating within one hour of the surface preparation.

4. Prime Coat: Tnemec N69-1211, Ameron 385, ICI Devoe Devran 224HS, Carboline 890, Sherwin-Williams Macropoxy 646 B58-600 series, PPG PITT-GUARD® Direct-to-Rust Epoxy Mastic Coating 97-145 series, or equal. Apply to a minimum thickness of 4 mils.

5. Finish Coat: Epoxy as described in System No. 10. Do not include the inorganic zinc prime coat described in that system.

B. System No. 54--Aluminum Insulation from Concrete and Carbon Steel:

1. Type: High solids epoxy or phenolic epoxy having a minimum volume solids of 80% (ASTM D2697).

2. Service Conditions: Coat areas of aluminum grating, stairs, structural members or aluminum fabrications, in contact with concrete or carbon steel with this system.

3. Surface Preparation: Solvent or steam cleaning per SSPC SP-1; do not use alkali cleaning. Then dust blast.

4. Coating System: Apply three or more coats of Ameron 400, Tnemec Series 135, ICI Devoe Bar-Rust 233H, Sherwin-Williams Macropoxy B58-600, PPG PITT-GUARD® Direct-to-Rust Epoxy Mastic Coating 97-145 series, or equal; 30 mils total. Maximum thickness of an individual coating shall not exceed the manufacturer's recommendation.

C. System No. 55--Repair of Galvanized Steel Surfaces:

1. Type: Cold galvanizing compound consisting of paint containing oils, solvents, and zinc dust and complying with MIL-P-21035. Minimum metallic zinc content in the cured coating shall be 90%.

2. Service Conditions: Repair of damaged galvanized coatings on steel surfaces.

3. Surface Preparation: Clean damaged surfaces per SSPC SP-1 and SP-11.

4. Coating System: Apply Z.R.C. Galvanizing Compound, RAMCO Specialty Products "Zinckit," NuWave "Galv-Match-Plus," Devcon "Cold Galvanizing," Clearco "Cold Galvanizing Spray," or equal to a minimum dry-film thickness of 3 mils. Apply per ASTM A780, Annex A2.

2.06 ARCHITECTURAL COATINGS AND FINISHES

A. System No. 73 – Clear Sealer on Exterior Concrete and Masonry:

1. Type: Silane with minimum solids of 22%.

2. Surface Preparation: In accordance with Part 3, subsection on "Preparation of Concrete and Masonry Surfaces To Be Coated."

3. Prime Coat: One coat Monochem Silane 20 Penetrating Sealer or Hydrozo Enviroseal 7, two coats Okon Block Plugger, one coat Rainstopper 140, two coats Carbocrete Sealer WB. Apply at 80 square feet per gallon.

4. Finish Coat: Two coats Hydrozo Enviroseal 7, one coat Okon W-2, one coat Rainstopper 140, one coat Carbocrete Sealer WB. Apply at 80 square feet per gallon.

B. System No. 81--Semi-Gloss Finish on Concrete, Masonry, or Plaster:

1. Type: Acrylic semi-gloss enamel with minimum volume solids of 30% with an acrylic primer-sealer.

2. Surface Preparation: In accordance with Para. 3.03 Preparation of Concrete and Masonry Surfaces To Be Coated.

3. Prime Coat: Dunn-Edwards W-715 Ultra-Grip, Frazee 168 Prime Plus, International Intercryl 510WB, ICI Dulux 3210, Carboline 3358, Tnemec Series 6, or equal; 2 mils.

4. Finish Coat: Two coats, 1.5 mils dry each, of Dunn-Edwards W-450V, Frazee 124 Mirro Glide SG, International Intercryl 530WB, ICI Dulux 1407, Carboline 3359, Tnemec Series 29, or equal.

C. System No. 85--Semi-Gloss Finish on Above Ground or Inside Vaults Metal Pipes and Appurtenances:

1. Type: Acrylic semi-gloss enamel with minimum volume solids of 55% with an alkyd or acrylic or solvent borne enamel metal primer.

2. Surface Preparation: SSPC SP-2 and SP-3. Note, if the metal pipe has not previously been fusion bond epoxy coated then surface preparation in accordance with SP-10 is required.

3. Prime Coat: Ellis 680 Series Solvent Borne Primers, Dunn-Edwards 43-5 (ferrous) or 43-7 (nonferrous); 3 mils.

4. Finish Coat: Two coats, 3 mils dry each, Ellis 4400 Solvent Borne Enamel, Dunn-Edwards, color "Ford Safety Blue".

2.07 ABRASIVES FOR SURFACE PREPARATION

A. Abrasives used for preparation of ferrous (excluding stainless steel) surfaces shall be one of the following:

1. Kleen Blast vitreous smelter slag #35.

2. 20 to 40 mesh garnet.

3. Crushed iron slag, 100% retained on No. 80 mesh.

4. SAE Grade G-40 or G-50 iron or steel grit.

B. In the above gradations, 100% of the material shall pass through the first stated sieve size and 100% shall be retained on the second stated sieve size.

C. Abrasive media shall consist of 100% new material. Recycled or previously used abrasive media shall not be permitted for use

PART 3 EXECUTION

3.01 WEATHER CONDITIONS

A. Do not paint in the rain, wind, snow, mist, and fog or when steel or metal surface temperatures are less than 5°F above the dew point.

B. Do not apply paint when the relative humidity is above 85% or the temperature is above 90° F.

C. Do not paint when temperature of metal to be painted is above 120°F.

D. Do not apply alkyd, inorganic zinc, silicone aluminum, or silicone acrylic paints if air or surface temperature is below 40°F or expected to be below 40°F within 24 hours.

E. Do not apply epoxy, acrylic latex, and polyurethane paints on an exterior or interior surface if air or surface temperature is below 60°F or expected to drop below 60°F in 24 hours.

3.02 SURFACE PREPARATION PROCEDURES

A. Remove oil and grease from metal surfaces in accordance with SSPC SP-1. Use clean cloths and cleaning solvents and wipe dry with clean cloths. Do not leave a film or greasy residue on the cleaned surfaces before abrasive blasting.

B. Remove weld spatter and weld slag from metal surfaces and grind smoothly rough welds, beads, peaked corners, and sharp edges including erection lugs in accordance with SSPC SP-2 and SSPC SP-3. Grind 0.020 inch (minimum) off the weld caps on pipe weld seams. Grind outside sharp corners, such as the outside edges of flanges, to a minimum radius of 1/4 inch.

1. Neutralize welds with a chemical solvent that is compatible with the specified coating materials. Use clean cloths and chemical solvent. Wipe dry with clean cloths. Do not leave a residue on the cleaned surfaces.

C. Do not abrasive blast or prepare more surface area in one day than can be coated in one day; prepare surfaces and apply coatings the same day. Remove sharp edges, burrs, and weld spatter.

D. Do not abrasive blast epoxy- or enamel-coated pipe that has already been factory coated, except to repair scratched or damaged coatings.

E. Steel that has pits 1/8" or greater shall be abrasive blasted, weld filled, and ground smooth matching the contour of the steel. Once filled, the weld repairs shall be re-blasted prior to application of the coating system.

F. For carbon steel, do not touch the surface between the time of abrasive blasting and the time the coating is applied. Apply coatings within two hours of blasting or before any rust bloom forms.

G. Surface preparation shall conform with the SSPC specifications as follows:

Solvent Cleaning	SP-1
Hand Tool Cleaning	SP-2
Power Tool Cleaning	SP-3
White Metal Blast Cleaning	SP-5
Commercial Blast Cleaning	SP-6
Brush-Off Blast Cleaning	SP-7
Pickling	SP-8
Near-White Blast Cleaning	SP-10
Power Tool Cleaning to Bare Metal	SP-11
Surface Preparation and Cleaning of Steel and Other Hard Materials by High- and Ultrahigh-Pressure Water Jetting Prior to Recoating	SP-12
Surface Preparation of Concrete	SP-13

H. Wherever the words "solvent cleaning," "hand tool cleaning," "wire brushing," or "blast cleaning" or similar words are used in these specifications or in paint manufacturer's specifications, they shall be understood to refer to the applicable SSPC (Society for Protective Coatings), surface preparation specifications listed above.

I. Dust blasting is defined as cleaning the surface through the use of very fine abrasives, such as siliceous or mineral abrasives, 80 to 100 mesh. Apply a fine etch to the metal surface to clean the surface of any contamination or oxide and to provide a surface profile for the coating.

J. Brush-off blasting of concrete and masonry surfaces is defined as opening subsurface holes and voids and etching the surface for a coating to bond.

K. For carbon steel surfaces, after abrasive blast cleaning, the height of the surface profile shall be 2 to 3 mils or per manufacturer's recommendation. Verify the surface profile by measuring with an impresser tape acceptable to the Resident Engineer. Perform a minimum of one test per 100 square feet of surface area. Testing shall be witnessed by the Resident Engineer. The impresser tape used in the test shall be permanently marked with the date, time, and locations where the test was made. Test results shall be promptly presented to the Resident Engineer.

L. Do not apply any part of a coating system before the Resident Engineer has reviewed the surface preparation. If coating has been applied without this review, if directed by the Resident Engineer, remove the applied coating by abrasive blasting and reapply the coat in accordance with this specification.

3.03 ABRASIVE BLAST CLEANING

A. Use dry abrasive blast cleaning for metal surfaces. Do not use abrasives in automatic equipment that have become contaminated. When shop or field blast cleaning with handheld nozzles, do not recycle or reuse blast particles.

B. After abrasive blast cleaning and prior to application of coating, dry clean surfaces to be coated by dusting, sweeping, and vacuuming to remove residue from blasting. Apply the specified primer or touch-up coating within the period of an eight-hour working day. Do not apply coating over damp or moist surfaces. Reclean prior to application of primer or touch-up coating any blast cleaned surface not coated within said eight-hour period.

C. Keep the area of the work in a clean condition and do not permit blasting particles to accumulate and constitute a nuisance or hazard.

D. During abrasive blast cleaning, prevent damage to adjacent coatings. Schedule blast cleaning and coating such that dust, dirt, blast particles, old coatings, rust, mill scale, etc., will not damage or fall upon wet or newly coated surfaces.

3.04 PREPARATION OF CONCRETE AND MASONRY SURFACES TO BE COATED

A. Surface preparation of concrete and masonry surfaces shall be in accordance with SP-13 and following.

B. Do not apply coating until concrete has cured at least 30 days. Finish concrete surfaces per Specification Section 03300, Cast-in-Place Concrete". Do not use curing compound on surfaces that are to be coated.

C. Concrete and masonry surfaces on which coatings are to be applied shall be of even color, gray or gray-white. The surface shall have no pits, pockets, holes, or sharp changes of surface elevation. Scrubbing with a stiff-bristle fiber brush shall produce no dusting or dislodging of cement or sand. Sprinkling water on the surface shall produce no water beads or standing droplets. Concrete and masonry shall be free of laitance and slick surfaces.

D. Detergent clean the concrete or masonry surface with trisodium phosphate per ASTM D4258. Then sandblast surfaces (brush-off blast).

E. Acceptance criteria for concrete surfaces shall be in accordance with SSPC SP-13, Table 1, "Severe Service."

F. Do not apply coatings to concrete when the concrete is outgassing. Apply coatings only when the concrete surface temperature is stable, not rising.

3.05 ABRASIVE BLAST CLEANING

A. Use dry abrasive blast cleaning for metal surfaces. Do not use abrasives in automatic equipment that have become contaminated. When shop or field blast cleaning with handheld nozzles, do not recycle or reuse blast particles.

B. After abrasive blast cleaning and prior to application of coating, dry clean surfaces to be coated by dusting, sweeping, and vacuuming to remove residue from blasting. Apply the specified primer or touch-up coating within the period of an eight-hour working day. Do not apply coating over damp or moist surfaces. Reclean prior to application of primer or touch-up coating any blast cleaned surface not coated within said eight-hour period.

C. Keep the area of the work in a clean condition and do not permit blasting particles to accumulate and constitute a nuisance or hazard.

D. During abrasive blast cleaning, prevent damage to adjacent coatings. Schedule blast cleaning and coating such that dust, dirt, blast particles, old coatings, rust, mill scale, etc., will not damage or fall upon wet or newly coated surfaces.

3.06 PROCEDURES FOR ITEMS HAVING SHOP-APPLIED PRIME COATS

A. After application of primer to surfaces, allow coating to cure for a minimum of two hours or per the manufacturer's curing table, whichever is longer, before handling to minimize damage.

B. When loading for shipment to the project site, use spacers and other protective devices to separate items to prevent damaging the shop-primed surfaces during transit and unloading. If wood spacers are used, remove wood splinters and particles from the shop-primed surfaces after separation. Use padded chains or ribbon binders to secure the loaded items and minimize damage to the shop-primed surfaces.

C. Cover shop-primed items 100% with protective coverings or tarpaulins to prevent deposition of road salts, fuel residue, and other contaminants in transit.

D. Handle shop-primed items with care during unloading, installation, and erection operations to minimize damage. Do not place or store shop-primed items on the ground or on top of other work unless ground or work is covered with a protective covering or tarpaulin. Place shop-primed items above the ground upon platforms, skids, or other supports.

E. Ductile iron pipe and fittings scheduled for painting as specified herein shall not receive factory applied bituminous prime coating.

3.07 FIELD TOUCH-UP OF SHOP-APPLIED PRIME COATS

A. Remove oil and grease surface contaminants on metal surfaces in accordance with SSPC SP-1. Use clean rags wetted with a degreasing solution, rinse with clean water, and wipe dry.

B. Remove dust, dirt, salts, moisture, chalking primers, or other surface contaminants that will affect the adhesion or durability of the coating system. Use a high-pressure water blaster or scrub surfaces with a broom or brush wetted with a solution of trisodium phosphate, detergent, and water. Rinse scrubbed surfaces with clean water.

C. Remove loose or peeling primer and other surface contaminants not easily removed by the previous cleaning methods in accordance with SSPC SP-7. Take care that remaining primers are not damaged by the blast cleaning operation. Remaining primers shall be firmly bonded to the steel surfaces with blast cleaned edges feathered.

D. Remove rust, scaling, or primer damaged by welding or during shipment, storage, and erection in accordance with SSPC SP-10. Take care that remaining primers are not damaged by the blast cleaning operation. Areas smaller than 1 square inch may be prepared per SSPC SP-11. Remaining primers shall be firmly bonded to the steel surfaces with cleaned edges feathered.

E. Use repair procedures on damaged primer that protects adjacent primer. Blast cleaning may require the use of lower air pressure, smaller nozzles, and abrasive particle sizes, short blast nozzle distance from surface, shielding, and/or masking.

F. After abrasive blast cleaning of damaged and defective areas, remove dust, blast particles, and other debris by dusting, sweeping, and vacuuming; then apply the specified touch-up coating.

G. Surfaces that are shop primed shall receive a field touch-up of the same primer used in the original prime coat.

3.08 PAINTING SYSTEMS

A. All materials of a specified painting system, including primer, intermediate, and finish coats, shall be produced by the same manufacturer. Thinners, cleaners, driers, and other additives shall be as recommended by the paint manufacturer for the particular coating system.

B. Deliver paints to the jobsite in the original, unopened containers.

3.09 PAINT STORAGE AND MIXING

A. Store and mix materials only in areas designated for that purpose by the Resident Engineer. The area shall be well-ventilated, with precautionary measures taken to prevent fire hazards. Post "No Smoking" signs. Storage and mixing areas shall be clean and free of rags, waste, and scrapings. Tightly close containers after each use. Store paint at an ambient temperature from 50°F to 100°F.

B. Prepare multiple-component coatings using all of the contents of the container for each component as packaged by the paint manufacturer. Do not use partial batches. Do not use multiple-component coatings that have been mixed beyond their pot life. Provide small quantity kits for touch-up painting and for painting other small areas. Mix only the components specified and furnished by the paint manufacturer. Do not intermix additional components for reasons of color or otherwise, even within the same generic type of coating.

3.10 PROCEDURES FOR THE APPLICATION OF COATINGS

A. Conform to the requirements of SSPC PA-1. Follow the recommendations of the coating manufacturer including the selection of spray equipment, brushes, rollers, cleaners, thinners, mixing, drying time, temperature and humidity of application, and safety precautions.

B. Stir, strain, and keep coating materials at a uniform consistency during application. Power mix components. For multiple component materials, premix each component before combining. Apply each coating evenly, free of brush marks, sags, runs, and other evidence of poor workmanship. Use a different shade or tint on succeeding coating applications to indicate coverage where possible. Finished surfaces shall be free from defects or blemishes.

C. Do not use thinners unless recommended by the coating manufacturer. If thinning is allowed, do not exceed the maximum allowable amount of thinner per gallon of coating material. Stir coating materials at all times when adding thinner. Thinners shall be added to coating materials only as required in accordance with manufacturer's printed literature and in the presence of the NACE Level III Coating Inspector. Quantities of thinner shall not exceed limits set by applicable regulatory agencies.

D. Do not flood the coating material surface with thinner prior to mixing. Do not reduce coating materials more than is absolutely necessary to obtain the proper application characteristics and to obtain the specified dry-film thicknesses.

E. Remove dust, blast particles, and other debris from blast cleaned surfaces by dusting, sweeping, and vacuuming. Allow ventilator fans to clean airborne dust to provide good visibility of working area prior to coating applications. Remove dust from coated surfaces by dusting, sweeping, and vacuuming prior to applying succeeding coats.

F. Apply coating systems to the specified minimum dry-film thicknesses as determined per SSPC PA-2.

G. Apply primer immediately after blast cleaning and before any surface rusting occurs, or any dust, dirt, or any foreign matter has accumulated. Reclean surfaces by blast cleaning that have surface colored or become moist prior to coating application.

H. Prior to the finish coat, apply a brush stripe coat of primer on welds, sharp edges, nuts, bolts, and irregular surfaces prior to the application of the prime and intermediate coats. Apply the brush coat prior to and in conjunction with the spray coat application. Apply the spray coat over the brush coat.

I. Before applying subsequent coats, allow the primer and intermediate coats to dry for the minimum curing time recommended by the manufacturer. In no case shall the time between coats exceed the manufacturer's recommendation.

J. Each coat shall cover the surface of the preceding coat completely, and there shall be a visually perceptible difference in applied shade or tint of colors.

K. Applied coating systems shall be cured at 75°F or higher for 48 hours. If temperature is lower than 75°F, curing time shall be in accordance with printed recommendations of the manufacturer, unless otherwise allowed by the Resident Engineer.

L. Assembled parts shall be disassembled sufficiently before painting or coating to ensure complete coverage by the required coating.

3.11 SURFACES NOT TO BE COATED

A. Do not paint the following surfaces unless otherwise noted in the drawings or in other specification sections. Protect during the painting of adjacent areas:

1. Concrete walkways.
2. Mortar-coated pipe and fittings.
3. Stainless steel.
4. Metal ladders.
5. Glass.
6. Roofings.
7. Fencing.
8. Copper tubing, red brass piping, and PVC piping except where such piping occurs in rooms where the walls are painted, or required for color coding.
9. Electrical fixtures except for factory coatings.
10. Nameplates or metal letters.
11. Grease fittings.
12. Brass and copper, submerged.
13. Buried pipe, unless specifically required in the piping specifications.
14. Fiberglass items, unless specifically required in the FRP specifications.
15. Aluminum handrail and grating.
16. Flange faces shall not be coated in the field. This requirement doesn't apply to factory applied fusion bonded epoxy coatings.

3.12 PROTECTION OF SURFACES NOT TO BE PAINTED

A. Remove, mask, or otherwise protect hardware, lighting fixtures, switch plates, aluminum surfaces, machined surfaces, couplings, shafts, bearings, nameplates on machinery, and other surfaces not intended to be painted. Provide drop cloths to prevent paint materials from falling on or marring adjacent surfaces. Protect working parts of mechanical and electrical equipment from damage during surface preparation and painting process. Mask openings in motors to prevent paint and other materials from entering the motors.

3.13 SURFACES TO BE COATED

A. Coat surfaces as described below:

1. Coat mechanical equipment as described in the various mechanical equipment specifications. Color of finish coat shall match the color of the connecting piping. Verify color with City.

2. Coat aboveground and exposed piping or piping in vaults and structures as described in the various piping specifications. Color of finish coat shall be as shown in the drawings or as selected by the City's Representative.

3. Coat valves as described in the various valve specifications. Aboveground valves, or valves in vaults and structures, shall match the color of the connecting piping.

4. Coat aluminum surfaces in contact with concrete per System No. 54.

5. Coat buried flanges, nuts and bolts, valves, flexible pipe couplings, exposed rebar in thrust blocks, and valve boxes per as specified in the particular specifications for the above items. Coat buried bolt threads, tie bolt threads, and nuts per System No. 25.

6. Coat exposed surfaces of enclosures, guard posts, valve boxes, blow-off boxes per WAS.

3.14 DRY-FILM THICKNESS TESTING

A. Measure coating thickness specified for carbon steel surfaces with a magnetic-type dry-film thickness gauge in accordance with SSPC PA-2. Provide certification that the gauge has been calibrated by a certified laboratory within the past six months. Provide dry-film thickness gauge as manufactured by Mikrotest or Elcometer.

B. Test the finish coat of metal surfaces (except zinc primer and galvanizing) for holidays and discontinuities with an electrical holiday detector, high-voltage type (100 volts per mil thickness). Provide measuring equipment. Provide certification that the gauge has been calibrated by a certified laboratory within the past six months. Provide detector as manufactured by Tinker and Rasor or PCWI Instrumentation.

C. Check each coat for the correct dry-film thickness. Do not measure within eight hours after application of the coating.

D. For metal surfaces, make five separate spot measurements (average of three readings) spaced evenly over each 100 square feet of area (or fraction thereof) to be measured. Make three readings for each spot measurement of either the substrate or the paint. Move the probe or detector a distance of 1 to 3 inches for each new gauge reading. Discard any unusually high or low reading that cannot be repeated consistently. Take the average (mean) of the three readings as the spot measurement. The average of five spot measurements for each such 100-square-foot area shall not be less than the specified thickness. No single spot measurement in any 100-square-foot area shall be less than 80%, nor more than 120%, of the specified thickness. One of three readings which are averaged to produce each spot measurement may underrun by a greater amount as defined by SSPC PA-2.

E. Perform tests in the presence of the Resident Engineer.

3.15 INSPECTION

A. The City may inspect the paint shop before, during and after coatings are applied and perform inspections of the completed coatings.

B. Contractor shall retain a NACE Level III Coating Inspector to inspect all field and shop-applied coatings.

C. Epoxy and polyurethane coatings will be subject to adhesion testing in accordance with ASTM D4541 requirements and applicable industry standards.

D. Provide the City with at least five working days' notice of the schedule to apply coatings.

3.16 REPAIR OF IMPROPERLY COATED SURFACES

A. If the item has an improper finish color or insufficient film thickness, clean and topcoat the surface with the specified paint material to obtain the specified color and coverage. Sandblast or power-sand visible areas of chipped, peeled, or abraded paint, feathering the edges. Then prime and finish coat in accordance with the specifications. Work shall be free of runs, bridges, shiners, laps, or other imperfections.

3.17 CLEANING

A. During the progress of the work, remove discarded materials, rubbish, cans, and rags at the end of each day's work.

B. Thoroughly clean brushes and other application equipment at the end of each period of use and when changing to another paint or color.

C. Upon completion of painting work, remove masking tape, tarps, and other protective materials, using care not to damage finished surfaces.

END OF SECTION

SECTION 09961
FUSION-BONDED EPOXY LININGS AND COATINGS

PART 1 GENERAL

1.01 DESCRIPTION

A. This section includes materials, application, and testing of one-part, fusion-bonded, heat-cured, thermosetting, 100% solids epoxy linings and coatings on steel, cast-iron, and ductile-iron equipment, such as valves, flexible pipe couplings, and steel pipe.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 09900 - Painting and Coating

1.03 SUBMITTALS

A. Submit shop drawings in accordance with the General Conditions and Specification Section 01300, "Submittals".

B. Submit manufacturer's catalog literature and product data sheets, describing the physical and chemical properties of the epoxy coating. Describe application and curing procedure.

C. Submit coating application test records for measuring coating thickness and holiday detection for each item or pipe section and fitting. Describe repair procedures used.

D. Color samples illustrating available colors for the epoxy coating.

PART 2 MATERIALS

2.01 PIPING AND EQUIPMENT SURFACES

A. The Contractor shall require the equipment suppliers to provide equipment that is free of salts, oil, and grease to the coating applicator.

B. The Contractor shall require pipe suppliers to provide bare pipe that is free of salts, oil, and grease to the coating applicator.

2.02 SHOP-APPLIED EPOXY LINING AND COATING

A. Lining and coating shall be a 100% solids, thermosetting, fusion-bonded, dry powder epoxy resin: Scotchkote 206N, City approved or equal. Color to be selected by the City. Epoxy lining and coating shall meet or exceed the following requirements:

Hardness (minimum)	Barcol 17 (ASTM D2583) Rockwell 50 ("M" scale)
Abrasion resistance (maximum value)	1,000 cycles: 0.05 gram removed
	5,000 cycles: 0.115 gram removed
	ASTM D1044, Tabor CS 17 wheel, 1,000-gram weight
Adhesion (minimum)	3,000 psi (Elcometer)
Tensile strength	7,300 psi (ASTM D2370)
Penetration	0 mil (ASTM G17)
Adhesion overlap shear, 1/8-inch steel panel, 0.010 glue line	6,000 psi, ASTM D1002
Impact (minimum value)	160 inch-pounds (Gardner 5/8-inch radius tup)

2.03 FIELD-APPLIED EPOXY COATING FOR PATCHING

A. Use a two-component, 80% solids liquid resin, such as Scotchkote 306.

2.04 PAINTING AND COATING OF GROOVED-END AND FLEXIBLE PIPE COUPLINGS

A. Line and coat couplings the same as the pipe. Color shall match the color of the pipe fusion epoxy coating.

PART 3 EXECUTION

3.01 SHOP APPLICATION OF FUSION-BONDED EPOXY LINING AND COATING—GENERAL

A. Grind surface irregularities, welds, and weld spatter smooth before applying the epoxy. The allowable grind area shall not exceed 0.25 square foot per location, and the maximum total grind area shall not exceed 1 square foot per item or piece of equipment. Do not use any item, pipe, or piece of equipment in which these requirements cannot be met.

B. Remove surface imperfections, such as slivers, scales, burrs, weld spatter, and gouges. Grind outside sharp corners, such as the outside edges of flanges, to a minimum radius of 1/4 inch.

C. Uniformly preheat the pipe, item, or piece of equipment prior to blast cleaning to remove moisture from the surface. The preheat shall be sufficient to ensure that the surface temperature is at least 5°F above the dew point temperature during blast cleaning and inspection.

D. Sandblast surfaces per SSPC SP-5. Protect beveled pipe ends from the abrasive blast cleaning.

E. After cleaning and surface preparation, test the surface for residual chloride concentration. If the residual chloride concentration exceeds 5 $\mu g/cm^2$, then apply a phosphoric acid wash to the surface after sandblasting. Apply a phosphoric acid wash to the pipe, item, or piece of equipment after sandblasting. The average temperature, measured in three different locations, shall be 80°F to 130°F during the acid wash procedure. The acid wash shall be a 5% by weight phosphoric acid solution. The duration in which the acid is in contact with the surface shall be determined by using the average temperature as tabulated below:

Surface Temperature (°F)	Contact Time (seconds)
80	52
85	45
90	36
95	33
100	28
105	24
110	21
130	10

After the acid wash has been completed, remove the acid with demineralized water having a maximum conductivity of 5 micromhos/cm at a minimum nozzle pressure of 2,500 psi.

F. Apply lining and coating by the electrostatic spray or fluidized bed process. Minimum thickness of lining or coating shall be 15 mils. Heat and cure per the epoxy manufacturer's recommendations. The heat source shall not leave a residue or contaminant on the metal surface. Do not allow oxidation of surfaces to occur prior to coating. Do not permit surfaces to flash rust before coating.

3.02 SHOP APPLICATION OF FUSION-BONDED EPOXY LINING AND COATING TO PIPE--ADDITIONAL REQUIREMENTS

A. Apply lining and coating per AWWA C213 except as modified herein.

B. Grind 0.020 inch (minimum) off the weld caps on the pipe weld seams before beginning the surface preparation and heating of the pipe.

3.03 QUALITY OF LINING AND COATING APPLICATIONS

A. The cured lining or coating shall be smooth and glossy, with no graininess or roughness. The lining or coating shall have no blisters, cracks, bubbles, underfilm voids, mechanical damage, discontinuities, or holidays.

3.04 FACTORY TESTING OF COATING--GENERAL

A. Test linings and coatings with a high-voltage holiday detector. Test pipe linings and coatings per NACE RPO 188-99. If the number of holidays or pinholes is fewer than one per 20 square feet of coating surface, repair the holidays and pinholes by applying the coating manufacturer's recommended patching compound to each holiday or pinhole and retest. If the number of pinholes and holidays exceeds one per 20 square feet of coating surface, remove the entire lining or coating and recoat the item or pipe.

B. Measure the coating thickness at three locations on each item or piece of equipment or pipe section using a coating thickness gauge calibrated at least once per eight-hour shift. Record each measured thickness value. Where individual measured thickness values are less than the specified minimum thickness, measure the coating thickness at three additional points around the defective area. The average of these measurements shall exceed the specified minimum thickness value, and no individual thickness value shall be more than 2 mils below or 3 mils above the specified minimum value. If a section of the pipe, item, or piece of equipment does not meet these criteria, remove the entire lining or coating and recoat the entire item or piece of equipment.

3.05 FACTORY TESTING OF LINING AND COATING OF PIPE--ADDITIONAL REQUIREMENTS

A. Check for coating defects on the weld seam centerlines. There shall be no porous blisters, craters, or pimples lying along the peak of the weld crown.

3.06 FIELD PAINTING

A. Patch scratches and damaged areas incurred while installing fusion-bonded epoxy coated items with a two-component, 80% solids (minimum), liquid epoxy resin. Wire brush or sandblast the damaged areas per SSPC SP-10. Lightly abrade or sandblast the coating or lining on the sides of the damaged area before applying the liquid epoxy coating. Apply a two-part epoxy coating to defective linings and coatings to areas smaller than 20 square inches. Patched areas shall overlap the parent or base coating a minimum of 0.5 inch. If a defective area exceeds 20 square inches, remove the entire lining and coating and recoat the entire item or piece of equipment. Apply the liquid epoxy coating to a minimum dry-film thickness of 15 mils.

B. All piping, valves and appurtenances shall have a consistent top finish coat consisting of two coats of Acrylic semi-gloss enamel, 3 mils dry each, Ellis 4400 Solvent Borne Enamel, Dunn-Edwards, color "Ford Safety Blue" per System No. 85 as specified in Specification Section 09900, "Painting and Coating.".

Coordinate finish coat requirements with the Resident Engineer.

END OF SECTION

SECTION 10200
LOUVERS AND VENTS

PART 1 GENERAL

1.01 SCOPE

A. This section covers the furnishing and installation of acoustical louvers. Combination louver/dampers, control dampers, fire dampers, adjustable louvers, penthouses, and smoke vents are covered in other sections.

1.02 GENERAL

A. Louvers shall be furnished and installed as specified herein and in accordance with the details, louver schedule, or arrangements indicated on the drawings.

B. Louvers shall be of the sizes required for opening sizes indicated on the drawings. Actual opening sizes for louvers scheduled for insertion within existing construction shall be field verified. Actual louver sizes shall allow for shim and caulk space.

1.03 SUBMITTALS

A. Complete specifications and detailed drawings covering arrangement, dimensions, hardware, color charts, accessories, and details of construction and installation of the louvers shall be submitted in accordance with Specification Section 01300, "Submittals".

1.04 COLOR SELECTION

A. Colors of louvers will be selected from the manufacturer's full line of colors by the City.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Shipping shall be in accordance with Specification Section 01612, "Shipping". Handling and storage shall be in accordance with Specification Section 01614, "Handling and Storage".

B. Materials shall be handled, transported, and delivered in a manner which will prevent bends, dents, scratches, or damages of any kind. Damaged materials shall be promptly replaced. Materials shall be stored off the ground and protected from the weather.

PART 2 PRODUCTS

2.01 ACOUSTICAL LOUVERS

A. Construction:

1. Material: Mill Finish galvannealed steel.

2. Frame: 8" deep x 16 ga. thick channel.

3. Blades: 35° x 22 ga. thick J-style with a 26 ga. thick perforated backing packed with noncombustible insulating material.

4. Screen: 18-by-16 mesh aluminum insect screen

5. Mullion: Visible.

B. Performance Data:

1. Based on testing 48 inch x 48 inch size unit in accordance with AMCA 500.

2. Free Area: 33.1% nominal

3. Free area size: 5.3 ft²

4. Maximum Recommended Air Flow thru Free Area: 808 fpm

5. Air Flow: 4,293 cfm

6. Maximum Pressure Drop: 0.07 in.wg.

7. Water penetration: Maximum of 0.01 ounces per square foot of free area at an air flow of 808 fpm free area velocity when tested for 15 minutes.

C. Sound Data

1. Tested in accordance with ASTME 90.

Octave Band	2	3	4	5	6	7
Center Freq. (hz)	125	250	500	1000	2000	4000
Transmission Loss	7	7	13	20	22	17
Noise Reduction	13	13	19	26	28	23

D. Design Load:

1. Wind Load: Louver designs shall withstand the effects of 30 psf of uniform pressure acting inward or outward.

2. Seismic Performance: Louvers, including attachments to other construction, shall withstand seismic effects determined by ASCE-7.

E. Finishes

1. Baked Enamel or Powder Coat Finish: Immediately after cleaning and pretreating, apply manufacturer's standard 2-coat baked-on finish consisting of prime coat and thermosetting topcoat, with a minimum dry thickness of 1 mil for topcoat to comply with coating manufacturer's written instructions.

2. Finishes shall meet the AAMA specification 605.2.

F. ACCEPTABLE PRODUCTS

1. Subject to the requirements specified herein, 8 inch deep acoustical louvers shall be equivalent to Pottorff model SAJ-835 or City approved equal.

PART 3 EXECUTION

3.01 GENERAL

A. Products shall be installed in accordance with this section, the manufacturer's instructions, and as indicated on the drawings.

B. Complete specifications and detailed drawings covering arrangement, dimensions, hardware, accessories, and details of construction and installation of the louvers and vents will be made available to the louver and vent installer.

3.02 INSTALLATION

A. The louvers shall be installed with anchors suitable for the adjacent material and shall be caulked as specified in Specification Section 07900, "Caulking". When required, bird screens or insect screens shall be installed on the louvers.

B. Where aluminum work is to be attached to steel supporting members or other dissimilar metal, the aluminum shall be kept from direct contact with such metals by a heavy coat of epoxy enamel in accordance with Specification Section 09900, "Painting and Coating". Aluminum surfaces which will be in contact with concrete or masonry when installed shall be given a heavy coat of epoxy enamel. All paint shall be dry and hard when the coated parts are installed.

END OF SECTION

SECTION 10990
MISCELLANEOUS SPECIALTIES

PART 1 GENERAL

1.01 ITEMS INCLUDED IN THIS SECTION ARE:

A. Splash Blocks

B. FRP Ladders

C. Ladder Safety Post

D. Fire Extinguishers

1.02 GENERAL

A. Miscellaneous specialties shall be furnished and installed as specified herein. Where not specifically indicated or specified, fasteners, gaskets, and other accessories shall be provided as required and as recommended by the manufacturer of the specific item.

1.03 SUBMITTALS

A. Complete specifications, detailed drawings, and setting or erection drawings covering miscellaneous specialties shall be submitted in accordance with Specification Section 01300, "Submittals"

PART 2 PRODUCTS

2.01 SPLASH BLOCKS

A. Precast reinforced concrete splash blocks shall be provided at the locations indicated on the drawings.

B. The block shall be approximately 16 inches wide by 30 inches long by 5 inches high with curbs on three sides. The splash portion shall be sloped from not less than 1-inch depth at the inlet end to not less than 2 inches at the outlet end. The block shall be reinforced with not less than WWF4X4-W4XW4 welded wire fabric.

2.02 FRP LADDERS

A. All ladders shall be designed and laid out in strict accordance with OSHA 1910.27 The ladder shall also be capable of supporting a concentrated vertical load of 1,200 pounds applied at the mid-span of the rung. Manufacturer shall be required to provide supporting test data for rung capacity.

a) All ladder side rails, rungs, ladder mounting brackets and cage straps are to be FRP structural shapes manufactured by the pultrusion process. All structural shapes shall be composed of fiberglass reinforcement and resin

in qualities, quantities, properties, arrangements and dimensions as necessary to meet the design requirements and dimensions as specified in the Contract Documents.

b) Fiberglass reinforcement shall be a combination of continuous roving, continuous strand mat, bi-directional roving mat and surfacing veil in sufficient quantities as needed by the application and/or physical properties required.

c) Resins shall be isophthalic polyester.

d) All finished surfaces of FRP items and fabrications shall be smooth, resin-rich, free of voids and without dry spots, cracks, crazes or unreinforced areas. All glass fibers shall be well covered with resin to protect against their exposure due to wear or weathering.

e) All pultruded ladder components shall be further protected from ultraviolet (UV) attack with 1) integral UV inhibitors in the resin and 2) a synthetic surfacing veil to help produce a resin rich surface

f) All FRP products shall have a tested flame spread rating of 25 or less per ASTM E-84 Tunnel Test.

g) The ladder side rail shall be 1-3/4" square tube with a wall thickness of 1/4" or greater. The rungs shall be 1-1/4" diameter pultruded structural shapes, continuously fluted to provide a non-slip surface. Rungs that are gritted as a secondary operation shall not be permitted. Ladder wall and floor mount shall be fabricated from pultruded angles, 3/8" minimum thickness.

h) All rungs shall be both mechanically attached to the ladder with stainless steel rivets and chemically bonded with epoxy.

i) All ladder components are to be integrally pigmented yellow.

j) Pultruded structural shapes used in the ladder system are to have the minimum longitudinal mechanical properties listed below:

Property	ASTM Method	Value	Units
Tensile Strength	D-638	30,000 (206)	psi (MPa)
Tensile Modulus	D-638	2.5 x 106 (17.2)	psi (GPa)
Flexural Strength	D-790	30,000 (206)	psi (MPa)
Flexural Modulus	D-790	1.8 x 106 (12.4)	psi (GPa)
Flexural Modulus (Full Section)	N/A	2.8 x 106 (19.3)	psi (GPa)
Short Beam Shear (Transverse)	D-2344	4,500 (31)	psi (MPa)
Shear Modulus (Transverse)	N/A	4.5 x 105 (3.1)	psi (GPa)

Property	ASTM Method	Value	Units
Coefficient of Thermal Expansion	D-696	8.0 x 10-6 (1.4 x 10 -6)	in/in/°F (cm/cm/°C)
Flame Spread	E-84	25 or less	N/A

k) All fasteners used in the ladder system are to be 316 SS. Rivets will be 18-8 stainless steel.

2.03 LADDER SAFETY POST

A. Furnish and install ladder safety post on all vault access ladders, similar to Bilco Model, LU-1. The ladder safety post shall be pre-assembled from the manufacturer.

B. Performance characteristics:

A. Tubular post shall lock automatically when fully extended.

B. Safety post shall have controlled upward and downward movement.

C. Release lever shall disengage the post to allow it to be returned to its lowered position.

D. Post shall have adjustable mounting brackets to fit ladder rung spacing up to 14" (356mm) on center and clamp brackets to accommodate ladder rungs up to 1-3/4" (44mm) in diameter.

C. Post: Shall be manufactured of high strength square tubing. A pull up loop shall be provided at the upper end of the post to facilitate raising the post.

D. Material of construction: Shall be steel

E. Balancing spring: A stainless steel spring balancing mechanism shall be provided to provide smooth, easy, controlled operation when raising and lowering the safety post.

F. Hardware: All mounting hardware shall be Type 316 stainless steel.

G. Finishes: Factory finish shall be yellow powder coat steel (Model LU-1).

2.04 FIRE EXTINGUISHERS

A. Portable fire extinguishers of the all-purpose, nitrogen-pressured, dry chemical type shall be provided as scheduled herein. The fire extinguishers shall be UL approved for Class A, B, and C fires and shall have a 10-pound capacity, such as Badger, Larsen, or Kidde of the types indicated and must be acceptable. Finish of shell shall be red with all metal handle and valve.

B. Wall-mounted fire extinguishers shall be mounted on suitable wall brackets in the rooms as scheduled. Final locations will be as directed by local Fire Marshall.

C. The following fire extinguishers shall be provided:

Location	Quantity	Mounting
Pump Station		
Pump Room, east wall	1	Wall
Pump Room, west wall	1	Wall

PART 3 EXECUTION

3.01 INSTALLATION

A. All products herein shall be installed as recommended by the manufacturer and as indicated on the drawings. All moving parts shall be properly lubricated and adjusted as required for proper operation.

END OF SECTION

SECTION 11060
EQUIPMENT INSTALLATION

PART 1 GENERAL

1.01 SCOPE

A. This section covers installation of new equipment units that have been purchased by Contractor as part of this Work.

B. Startup requirements shall be as indicated in Specification Section 01650, "Startup Requirements".

1.02 GENERAL

Equipment installed under this section shall be erected and placed in proper operating condition in full conformity with drawings, specifications, engineering data, instructions, and recommendations of the equipment manufacturer, unless exceptions are noted by Engineer.

When pumping units are being installed, hydraulic considerations and definition of terms shall be as set forth in the Hydraulic Institute Standards.

Any equipment identified as being provided by others will be furnished complete for installation by Contractor. Technical specifications under which the equipment will be purchased are available.

A. Coordination

1. When manufacturer's field services are provided by the equipment manufacturer, Contractor shall coordinate the services with the equipment manufacturer. Contractor shall give Engineer written notice at least 30 days prior to the need for manufacturer's field services furnished by others.

2. Submittals for equipment furnished by others under each procurement contract will be furnished to Contractor upon completion of review by Engineer. Contractor shall review equipment submittals and coordinate with the requirements of the Work and the Contract Documents. Contractor accepts sole responsibility for determining and verifying all quantities, dimensions, and field construction criteria.

3. Flanged connections to equipment including the bolts, nuts, and gaskets are covered in the appropriate pipe specification section.

1.03 DELIVERY, STORAGE, AND HANDLING

A. Storage

1. Upon delivery, all equipment and materials shall immediately be stored and protected by Contractor in accordance with Specification Section 01614,

"Handling and Storage" until installed in the Work. Equipment shall be protected by Contractor against damage and exposure from the elements. At no time shall the equipment be stored on or come into contact with the ground, grass, or any other type of vegetation. Contractor shall keep the equipment dry at all times.

PART 2 PRODUCTS

2.01 MATERIALS

A. Materials shall be as follows:

Grout: As specified in Specification Section 03600, "Grout".

2.02 NAME PLATES

A. Equipment nameplates of Type 316 stainless steel shall be engraved on stamped and fastened to the equipment in an accessible location with No. 4 or larger oval head Type 316 stainless steel screws or drive pins. Nameplates shall contain the manufacturer's name, model, serial number, size, weight, characteristics, and appropriate data describing the machine performance ratings.

PART 3 EXECUTION

3.01 INSTALLATION

A. General

1. The following items, including but not limited to, shall be installed by the Contractor:

   a) Vertical turbine pumps

   b) HVAC Equipment

2. Equipment shall not be installed or operated except by, or with the guidance of, qualified personnel having the knowledge and experience necessary to obtain proper results as specified in Specification Section 01650, "Startup Requirements".

3. Each equipment unit shall be leveled, aligned, and shimmed into position. Installation procedures shall be as recommended by the equipment manufacturer and as required herein. Shimming between machined surfaces will not be permitted.

4. Unless otherwise indicated or specified, all equipment shall be installed on concrete bases at least 6 inches high. Baseplates shall be anchored to the concrete base with required anchor bolts. For equipment with grouted bases, the space beneath shall be filled with grout as specified in

Specification Section 03600, "Grout". The equipment base shall be grouted after initial fitting and alignment.

5. Anti-seize thread lubricant shall be liberally applied to the threaded portion of all stainless steel bolts during assembly.

6. When specified in the equipment sections, the equipment manufacturer will provide installation supervision and installation checks. For installation supervision, the manufacturer's field representative will observe, instruct, guide, and direct Contractor's erection or installation procedures as specified in the equipment specifications. For installation checks, the manufacturer's field representative will inspect the equipment installation immediately following erection by Contractor, and observe the tests indicated in Specification Section 01650, "Startup Requirements". The manufacturer's representatives will revisit the site as often as necessary to ensure installation satisfactory to City.

B. Pumping Units

a) When pumping units are to be installed, the equipment shall be installed in accordance with the Hydraulic Institute Standards. When installing pumping units, the equipment base shall be grouted after initial fitting and alignment, but before final bolting of connecting piping. Special care shall be taken to maintain alignment of pumping unit components. No stresses shall be transmitted to the pump flanges. After final alignment and bolting, connections to pumping equipment shall be tested for applied piping stresses by loosening the flange bolts. If any movement or opening of the joints is observed, piping shall be adjusted to proper fit.

b) Couplings shall be realigned after grouting. Final coupling misalignment shall be within one-half of the coupling manufacturer's allowable tolerance.

c) Vertical Turbine Pumps

i) When intermediate shafting is specified, the shafting shall be installed in accordance with the manufacturer's recommendations.

d) Contractor to provide reducers adjacent to pump suction and discharge flanges as required for connection to selected pump.

C. HVAC Equipment

1. Contractor shall be responsible for the installation of the HVAC system and all appurtenances as required for a complete working system.

3.02 STARTUP AND TESTING

Startup requirements, and tests associated with startup shall be as indicated in Specification Section 01650, "Startup Requirements". Other field tests shall be as indicated in the specific equipment sections. Startup and tests required shall occur in the order listed in the following paragraphs. Tests shall not begin until any installation supervision and installation checks by the equipment manufacturer have been completed, except where noted below.

A. Preliminary Field Tests

1. Preliminary field tests shall be conducted on all equipment by Contractor as indicated in Specification Section 01650, "Startup Requirements". When an installation check is specified in the equipment sections, the equipment manufacturer's representative will participate in these tests to the extent described in Specification Section 01650, "Startup Requirements" and in the equipment sections.

B. Field System Operation Tests

1. Field system operation tests shall be conducted on all equipment by Contractor as indicated in the Specification Section 01650, "Startup Requirements". When an installation check is specified in the equipment sections, the equipment manufacturer's service personnel will participate in these tests to the extent described in Specification Section 01650, "Startup Requirements" and in the equipment sections.

C. Field Demonstration Tests

1. Field demonstration tests will be conducted by the equipment manufacturer on equipment as indicated and as specified in the equipment sections.

D. Field Performance Tests & Distribution Tests

1. Field performance tests or distribution tests will be conducted by the equipment manufacturer on equipment as indicated and as specified in the equipment sections.

E. Field Baseline Performance Tests

1. Field baseline performance tests shall be conducted by Contractor on the equipment indicated in the equipment sections, and the tests shall be performed as indicated. When indicated in the equipment sections, the equipment manufacturer will participate in these tests. This test shall not be considered an acceptance test, but rather a test to determine initial performance curves and efficiency just prior to the equipment entering service.

END OF SECTION

SECTION 11205
SUBMERSIBLE SUMP PUMPS

PART 1 GENERAL

1.01 SCOPE

A. The Contractor shall furnish, install, and place into successful operation sump pumps for drainage of process areas as shown on the plans and specified herein. Like items of equipment specified herein shall be the end products of one manufacturer to achieve standardization of appearance, maintenance, spare parts, and manufacturer's services.

1.02 SUBMITTALS

The Contractor shall submit information in accordance with Specification Section 01300, "Submittals", to substantiate compliance with this specification. In addition, the following specific information shall be submitted.

A. Shop Drawings

1. Performance data curves shall be provided showing head and capacity.

2. Materials of construction.

B. Operation and Maintenance Manuals

1. O&M manuals shall be furnished for the equipment herein specified in accordance with Specification Section 01730, "Operations and Maintenance Data".

PART 2 PRODUCTS

2.01 METER VAULT SUMP PUMP

A. Sump pumps shall be manufactured by Zoeller Pump Co. or City approved equal.

B. Design Characteristics

1. The sump pumps within the following process areas shall have the following characteristics:

Pump Type	Submersible Sump Pump
Capacity	25 gpm
Total head	13 ft
Solids Handling	1/2 inch
Discharge Size	1-1/2" NPT

Controls	Automatic integral float switch (piggy-back switches are not allowed)
Power	208 V, 1 Ph, 10 amp maximum

C. PUMP CONSTRUCTION DETAILS

1. Materials of Construction.

The pump shall be furnished with the materials specified herein, Manufacturer's standard cast iron, unless otherwise hereinafter specified.

a) Body, cover, motor housing, pump housing and base: Cast iron with powder coated epoxy finish.

b) Motor: Oil-filed and hermetically sealed, with automatic resetting thermal overload switch.

c) Impeller: Non-clogging cast iron vortex impeller with stainless steel shaft.

d) Pump Handle, Screws, Float Arm and Guard: Stainless Steel.

e) Power Cord: 15 ft long, U.L. listed neoprene cord.

D. PUMP ACCESSORIES

1. Pump Nameplate

A corrosion-resistant nameplate shall be attached to the pump in a clearly visible, easily accessible location. The nameplate shall be stamped with the following information:

a) Manufacturer's name.

b) Manufacturer's model number.

c) Manufacturer's shop order number or serial number.

d) Capacity, gpm.

e) Head, ft.

f) Speed, rpm.

g) Pump rotation shall be indicated by a permanent metal or cast label.

2. Spare Parts

a) Spare Parts and Special Tools for this Set of Pumps: One complete set of any special tools required to dismantle pump.

3. Lifting Lugs

a) Equipment weighing over 80 lbs shall be provided with lifting lugs

2.02 ELECTRICAL CONTROL PANEL

A. Electrical control panel and wiring shall be in accordance with Division 16.

PART 3 EXECUTION

3.01 PREPARATION FOR SHIPMENT

A. Insofar as is practical, the equipment specified herein shall be factory assembled. The pump, parts, and assemblies that are of necessity shipped unassembled shall be packaged and tagged in a manner that will protect the equipment from damage and facilitate the final assembly in the field. Generally, machined and unpainted parts shall be protected from damage by the elements with the application of strippable, protective coatings. Provide all lubricant required for initial lubrication.

3.02 INSTALLATION

A. The pump and motor shall be installed in strict accordance with the manufacturer's recommendations and as shown on the plans.

B. All strain from attached piping shall be eliminated from the pumps and any evidence of noisy operation, or other signs of improper setting shall be corrected by the Contractor.

END OF SECTION

SECTION 11214
VERTICAL TURBINE PUMPS

PART 1 GENERAL

1.01 DESCRIPTION

A. This section includes materials, testing, and installation of vertical turbine pumps in cans for water service.

1. Pump designation. 69th and Mohawk Pump Station
2. Number of pumps. 6
3. Pump tag numbers. P-01, P-02, P-03, P-04, P-05, P-06
4. Pump location. San Diego, CA

B. Each pumping unit shall be complete with a pump, electric motor, pedestal, pump barrel, anchor bolts, taps, gauges, lifting eyes, and all other appurtenances specified or required for proper installation and operation. The pump shall be designed for constant and variable speed operation as indicated.

C. Except as modified or supplemented herein, all vertical turbine pumps shall conform to the applicable requirements of the American National Standards Institute and latest edition of Hydraulic Institute standards (HIS).

D. Each item of equipment and each part shipped separately shall be tagged and identified with indelible markings for the intended service. Tag number shall be clearly marked on all shipping labels and on the outside of all containers.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 01650 - Startup Requirements

B. Section 03300 - Cast-in-Place Concrete

C. Section 09900 - Painting and Coating

D. Section 09961 - Fusion-Bonded Epoxy Linings and Coatings

E. Section 16040 - Electric Motors

F. Section 16269 - Adjustable Frequency AC Controllers

1.03 SUBMITTALS

A. Submit shop drawings in accordance with Specification Section 01300, "Submittals". The pump submittal package shall be inclusive of all items specified herein. An incomplete submittal package will be rejected as non-responsive.

B. Submit dimensional drawings. Include in the drawings the configuration of the fabricated steel discharge heads showing the mounted motors and adjacent pumping units.

C. Submit manufacturer's catalog data and detail drawings showing all pump parts and described by material of construction, specification (such as AISI, ASTM, SAE, or CDA), and grade or type. Show linings and coatings.

D. Submit pump manufacturer ISO-9001 certification per Part 2.01.A. As an alternative, provide a letter from the pump manufacturer accepting warranty responsibility for the entire pump assembly including, pumps, discharge heads, shafting, columns, motors, pump cans, bases, and anchor bolts.

E. Show shaft diameter and bearing spacing. Submit calculations showing shaft critical frequency and determination of bearing spacings.

F. Submit pump curves on which the specified operating points are marked. Show efficiency and brake horsepower for the selected pump curve. Show required NPSH.

G. As part of the field test procedure for the pumps, record measurements for impeller adjustment at the top of shaft and total radial shaft deflection (shaft runout) above the stuffing box or seal chamber and submit for City review.

H. Submit manufacturer's sample form for reporting performance test results. The test form should contain the data presented in the sample form in Section 6 of the ASME PTC 8.2 or ANSI/HI 2.6.

I. Each pump shall be tested with its respective job motor. As such, do not correct test results for speed.

J. Submit manufacturer's certified performance curves for approval at least three (3) weeks prior to shipping the units from the factory. Show pump total head, torque, brake horsepower, pump efficiency, required submergence, and required NPSH. Show at least 7 head/flow conditions on the certified curves. Provide copies of the data recorded during the test and methods of data reduction for determining certified test results.

K. Submit report on results of factory resonance test and modal shape signature results. Include calibration records for all instruments used in the performance of these tests.

L. Submit report on test results of pump cans.

M. Submit motor data per Specification Section 16040, "Electric Motors".

N. Submit manufacturer's requirements for pump and pump can alignment limits and manufacturer's approved methods for field measurement.

O. Submit written documentation signed by the Contractor that confirms the pump cans have been set (installed) and field measured to meet the vertical alignment requirements established by the manufacturer. The pump supplier shall submit written documentation to verify the field measurements were performed in accordance with their approved methods and the vertical alignments of the installed pump cans are acceptable.

P. Submit written documentation on regarding pump coating materials, surface preparation, and application procedures, including holiday and DFT testing.

Q. Submit Operation and Maintenance manuals for City review and approval in accordance with Specification Section 01730, "Operation and Maintenance Data".

1.04 DEFINITIONS

A. Terms shall be as defined in ANSI/HI 2.1-2.5 for vertical pumps.

1.05 MANUFACTURER'S SERVICES

A. Provide equipment manufacturer's services at the jobsite for the minimum labor days listed below, travel time excluded:

1. Two labor days for each service listed in the subsection on "Service Conditions" to check and verify the installation and advise during initial start-up, field testing, and adjustment of the equipment.

2. One labor day to instruct the City's personnel in the operation and maintenance of the equipment.

PART 2 MATERIALS

2.01 PUMP DESIGN

A. Equipment for the pumps, including discharge heads, shafting, columns, motors, pump cans, bases, and anchor bolts, shall be provided as a complete unit by the pump manufacturer in an ISO 9001 certified facility or by a pump manufacturer accepting warranty responsibility for the complete pump unit. Pump units assembled by entities other than the pump manufacturer will not be acceptable.

B. Each pump shall be capable of at least a 5% head increase at normal operating conditions by installing a larger impeller or an impeller of different hydraulic design.

C. Pump curve shall be continuously rising and shall be free of dips and valleys from the design point to the shutoff head. The shutoff head shall be at least 120% of the head that occurs at the design point.

D. Design the pump and its components to operate continuously over a preferred operating range (POR, as defined in ANSI/HI 9.6.3-1997) of 70% to 120% of the flow at the BEP.

E. Service Conditions: The pumping units shall be suitable for the following service conditions:

1. Seismic zone. 4
2. Type of environmental exposure. Indoor
3. Ambient air temperature range. 30 to 105 °F
4. Liquid temperature range. 50 to 70 °F
5. Solids concentration, percent by weight. None %
6. Pumps start and stop against a closed valve. Yes
7. Hydraulic Grade Line (Suction): 536 ft
8. Hydraulic Grade Line (Discharge): 645 ft
9. Site elevation. 470 ft
10. Units subject to freezing temperatures. No
11. Size of solids: None
12. Crane facilities available: No

2.02 MOTORS

A. Motors shall be vertical high thrust, solid shaft. Motors shall be as further described in the subsection on "Service Conditions."

B. The driver motor thrust bearing loading shall include the total pump lineshaft downthrust. Design the motor bearings to withstand any momentary total upthrust equivalent to at least 30% of the maximum downthrust developed.

C. Motor name plate shall include the oil type and quantity needed for the motor bearings per Specification Section 16040, "Electric Motors".

2.03 COUPLINGS AND COUPLING GUARDS

A. For solid shaft motors, comply with API 610 (tenth edition), paragraphs 6.2.2, 6.2.3, 6.2.6, 6.2.7, 6.2.14, and 8.3.8.2. Provide four-piece flanged adjustable spacer type couplings between the motor and pump shafts. Coupling shall be steel. The spacer shall be of sufficient length to permit the removal of the seal and sleeve without disturbing the driver. Provide coupling guards conforming to CAL/OSHA requirements.

2.04 DISCHARGE HEADS

A. Provide a fabricated steel discharge head. The discharge head shall have bolted register or rabbet-fit connections for the motor. Discharge head shall have connections for the pump column and shall support the loadings which it imposes as well as contain the pump pressure.

B. Seal weld all crevices on interior surfaces of discharge head, couplings, pump mounting flange, and inlet pipe.

C. Design columns and discharge heads for 150% of the pump discharge pressure (suction pressure plus pump differential pressure) at shutoff.

D. Access to the seal chamber or stuffing box shall be through windows placed 90 degrees from the discharge. Fit handholes and/or windows with Type 304 stainless steel expanded metal guards per CAL/OSHA requirements. Guards shall be removable and shall be form fitted.

E. The discharge shall be flanged, having a pressure rating as shown in the subsection on "Service Conditions."

1. Class 150 flanges shall comply with AWWA C207, Class E.

2. Flanges shall be flat face.

3. Butt welds shall be full penetration welds. Fabricated flanges shall be welded both inside and out.

4. Fabricated steel discharge elbows shall have at least four pieces per AWWA C208, Table 2.

F. Provide for lifting the heads by means of welded lifting eyes that are capable of sustaining the load of the complete unit less the motor, and the extra weight associated with separating the pump from the pump can.

G. A 1/2 inch NPT tapped and plugged pressure gauge connection shall be provided on the horizontal center line of the pump discharge outlet. The size and configuration of the connection shall conform to figures 2.6.17 and 2.6.18 of the HIS.

H. Provide jack bolts on stuffing box.

I. Pump rotation direction shall be integrally fabricated onto the exterior of the discharge head and visible after pump installation.

2.05 LUBRICATION

A. Pumps shall have open lineshafts and shall be self-lubricated.

2.06 COLUMN PIPE

A. The column pipe joints shall be flanged and bolted to the discharge head and to the pump bowl assembly and shall have register fits at each end. Material shall be as listed in the subsection on "Pump Materials of Construction." Provide bearing retainer containing a neoprene bearing as an integral part of the top end of each section where a lineshaft bearing is used. Top and bottom column pipe sections shall not exceed 5-foot length.

B. Column pipe joints shall be flanged.

2.07 SHAFTS AND BEARINGS

A. Support the shafting by bearings at intervals so that the first natural frequency of the rotating assembly is at least 30% above the maximum operating speed. Provide an additional bearing retainer just below the head for added support. Calculate and size the shaft diameter for the pump shutoff head and the maximum horsepower conditions.

B. For pumps having operating speeds 1,800 rpm and less with water-lubricated neoprene bearings, the bearing spacing for the intermediate columns shall not exceed 10-foot lengths. The bearing spacings for the top and bottom column sections shall not exceed 5 feet.

C. Tolerance on the shaft diameter, with the shaft rotated on centers, shall not exceed 0.001-inch TIR. Shaft runout on the stuffing box or seal chamber face and at the impeller shall not exceed 0.002-inch full indication movement. The shaft stiffness shall limit the total deflection under the most severe dynamic conditions over the allowable operating range of the pump, with the maximum impeller diameter installed, to 0.002 inch at the primary seal faces or at the stuffing box faces.

D. Pump shaft sections shall be machined or ground and finished throughout their entire length. The total indicated runout shall not exceed 0.0005 inch per foot of length. Total runout shall not exceed 0.008 inch over total shaft length.

E. Shaft couplings shall be of the key and thrust-ring type. Thrust rings, cap screws, and keys shall be Type 410 stainless steel.

F. Provide lineshafting with hardened sleeves under neoprene bearings per API 610 (eleventh edition).

2.08 BOWL ASSEMBLY

A. Each bowl assembly shall consist of the bowl, impeller and impeller shafting, and bearings. Bearings shall be located above and below the impeller. Bearings shall have an AFBMA L-10 life of at least 20,000 hours at any specified flow condition excluding the shutoff head. Impellers shall be dynamically balanced.

B. Pump bowls shall be of the material listed under the subsection on "Pump Materials of Construction." Bowls shall be sufficiently rigid to prevent adverse

changes in bearing alignment and to maintain the running clearance of wear rings. Bowls shall be flanged with male and female rabbets or registers for joining to the suction bell and the discharge column. Waterways and the diffusion vanes shall be smooth and free from nodules, bumps, and dips. Casting quality shall be inspected in accordance with MSS SP-55.

C. Provide the bowls with a renewable wear ring adjacent to the impeller, made of stainless steel as indicated under "Pump Materials of Construction." Wear rings and running clearances shall not exceed 0.002-inch clearance per inch of diameter.

2.09 SUCTION BELL

A. The suction bell shall have, as an integral part, vanes supporting a central hub in which the bottom bearing is carried below the impeller. The outer suction bell entrance shall be at least the size of the maximum pump bowl dimension and as much larger as is practical. Maximum entrance fluid velocity shall not exceed 6 fps at the specified maximum flow. The contour between the outer edge and the impeller suction eye shall be smooth, continuous, and bell shaped. The suction bell shall be equipped with 316 SST strainer.

2.10 IMPELLERS

A. Pump impellers shall be of the enclosed type made of the material listed in the subsection on "Pump Materials of Construction" and shall be cast in one piece. Machine impellers to fit the contour of the bowl and hand file in the waterways.. Attach impellers to the shaft with stainless steel wear rings using key style in such a manner that they cannot become loose under any operating condition or under reverse rotation. Impellers and wear rings shall have a 50 BHN minimum differential in hardness to prevent galling. Provide for adjustment of the axial position of the impeller at the top of the pump or motor so that proper clearance between bowls and impellers may be maintained.

2.11 VIBRATION AND RESIDUAL UNBALANCE

A. The maximum vibration levels measured in the field of the completed installation shall not exceed those shown in Figures 9.6.4.13 and 9.6.4.14 in ANSI/HI 9.6.4-2009. Maximum residual unbalance in rotors shall not exceed that shown in Figure 9.6.4.15B in ANSI/HI 9.6.4.

B. The Contractor shall require that the pump manufacturer determine whether the infinite mass and rigidity described in ANSI/HI 9.6.4-2009, paragraph 9.6.4.5.2 is applicable to the service conditions in this project and to select the appropriate analytical method to determine the critical speed and resonant frequencies of the installed pump system. At a minimum, the pump system shall include the bowls, impellers, lineshaft diameters, lineshaft bearing spacing, column diameter and wall thickness, the design of the discharge stand or motor stand with discharge nozzle, and the baseplate and soleplate dimensions (length, width, and thickness). The natural frequency shall have a sufficient separation margin to not affect the pump system's vibration at any operating speed.

2.12 PUMP MATERIALS OF CONSTRUCTION

A. Materials of construction shall conform to the requirements listed below. Materials of construction for components not listed below shall conform to API 610, Annex H, Material Class I-2.

Component	Material
Pump shafts and couplings	Stainless steel, ASTM A276, UNS Grade S31600 or S41000
Bowl wear rings	Stainless steel, ASTM A743, Grade CF-8M or CA-15; or ASTM A276, Type 410;
Bearing retainers (fabricated integral)	Welded integral
Lineshaft bearings	Neoprene.
Impellers	Stainless steel ASTM A743, Grade CF-8M.
Impeller wear rings	Stainless steel: ASTM A743, Grade CF-8M or CA-15 or ASTM A276, Type 410.
Suction strainer	Stainless steel, AISI Type 316.
Pump bowls and suction bell	Cast iron, ASTM A48, Class 30 or ductile iron, ASTM A536.
Bowl bearings	Bronze; see paragraph C below.
All parts made of fabricated steel including discharge head	Carbon steel, ASTM A283, Grade B or C; ASTM A36; or ASTM A53, Grade B.
Column pipe	Carbon steel, ASTM A283, Grade B or C, or ASTM A53, Grade A or B.
Flanges	ASTM A105, A181, or A182.
Bolts and nuts for discharge heads, column pipe flanges, and bowl flanges. See paragraph D below	Bolts shall be Type 316 stainless steel conforming to ASTM A193, Grade B8M. Nuts shall be Type 316 stainless steel conforming to ASTM A194, Grade 8M.
Submerged bolts and nuts	Stainless steel, Type 316.
Any bronze components in contact with water	See paragraph C below.

B. Impeller and bowl wear ring materials shall have a minimum Brinell hardness difference of 50, unless both the stationary and the rotating wear surfaces have Brinell hardness numbers of at least 400.

C. Bronze shall have the following chemical characteristics:

Constituent	Content
Zinc	7% maximum
Aluminum	2% maximum
Lead	8% maximum
Copper + Nickel + Silicon	83% minimum

2.13 STRAINERS

A. Stainless steel, Type 316, suction strainers on the inlet to each pump are required.

2.14 PUMP CANS

A. Suction flange on can inlet pipe shall be the diameter and location as shown on the drawings and have a pressure rating of 150 psi. Inside diameters and depths of the cans shall be as indicated:

1. Other aspects of the design of the can or barrel shall comply with ANSI/HI 9.8-1998, Section 9.8.2.6.

2. Straightening vanes along can walls and bottom (cross) shall have rounded edges with no joint cavities. All metal to metal contact points shall have continuous welds and all welds shall be ground smooth.

B. Construct steel cans of pipe conforming to ASTM A53 (Type E or S), Grade B; ASTM A134; ASTM A135, Grade B; or AWWA C200. Cans made of material conforming to ASTM A134 shall be made of steel conforming to ASTM A36, A283 (Grade C or D), or A285 (Grade C). Cans shall be standard weight per ASME B36.10. Welding procedures and certification of welders shall conform to AWS D1.1.

C. Line interior and coat exterior of the can with fusion-bonded epoxy per Specification Section 09961, Fusion Bonded Epoxy Coatings and Linings".

D. Provide a flange at the top of the pump can so the pump discharge head can be bolted onto the can. Pressure rating of pump can top flange shall be as indicated under "Service Conditions." Flange material shall conform to ASTM A105, A181, or A182. Flanges shall be flat face. Gaskets shall be full-face, 1/8 inch thick, and shall be one of the following nonasbestos materials:

1. Acrylic or aramid fiber bound with nitrile. Products: Garlock "Bluegard," Klinger "Klingersil C4400," or equal. Gaskets shall be suitable for a water pressure of 500 psi at a temperature of 400°F.

E. Bolts and nuts for flanges shall be Type 316 stainless steel, conforming to ASTM A193 (Grade B8M) for bolts and ASTM A194 (Grade 8M) for nuts and washers.

F. Test pump cans at the place of manufacture per the referenced ASTM standards for the pipe. Test the seams by the dye-penetrant method per ASTM E165, Method

B. Perform hydrostatic test using blind flange connections with a test pressure of 150 psi and hold for 2 hours. Submit test results for City approval.

2.15 MECHANICIAL SEALS

A. Products: Mechanical Seals shall be cartridge type manufactured by A.W. Chesterton. No substitutions will be permitted.

2.16 SPARE PARTS

A. Provide the following spare parts for each model of pump:

Quantity	Description
Three	Mechanical seals

B. Pack spare parts in wooden boxes with dessicant; label with manufacturer's name and local representative's name, address, and telephone number; and attach list of materials contained therein.

PART 3 EXECUTION

3.01 SERVICE CONDITIONS – PUMPS P-01, P-02 AND P-03

A. Pump Curve Data

Capacity (gpm)	Pump Total Head (feet)[1]	Minimum Pump Efficiency (%)
P-01, P-02 AND P-03		
2,260	150	79
2,750[2]	123	83
3,190	100	81
[1]Pump manufacturer to add for pump internal friction losses, such as in columns and discharge heads. [2]Design point.		

B. Pump Data

Pump	P-01, P-02 and P-03
Maximum pump speed	1,800 rpm
Minimum NPSH available	85 feet
Motor horsepower (minimum)	125
Motor type	Per Section 16040
Pump lubrication	Open lineshaft

Pump	P-01, P-02 and P-03
Discharge connection size	12 inches
Minimum column size	12 inches
Minimum column wall thickness	0.375 inch
Can top flange and suction flange rating	Class 150
Discharge flange rating	Class 150
Bearing lubrication	Water
Suction strainer	Yes

3.02 SERVICE CONDITIONS – PUMPS P-04, P-05 AND P-06

A. Pump Curve Data

Capacity (gpm)	Pump Total Head (feet)[1]	Minimum Pump Efficiency (%)
P-04, P-05 AND P-06		
970	150	79
1,500[2]	123	83
1,780	100	81
[1]Pump manufacturer to add for pump internal friction losses, such as in columns and discharge heads. [2]Design point.		

B. Pump Data

Pump	P-04, P-05 and P-06
Maximum pump speed	1,800 rpm
Minimum NPSH available	85 feet
Motor horsepower (minimum)	75
Motor type	Per Section 16040
Pump lubrication	Open lineshaft
Discharge connection size	12 inches
Minimum column size	8 inches
Minimum column wall thickness	0.375 inch
Can top flange and suction flange rating	Class 150
Discharge flange rating	Class 150

Pump	P-04, P-05 and P-06
Bearing lubrication	Water
Suction strainer	Yes

C. All pumps shall be from the same manufacturer.

3.03 WELDING PROCEDURE AND WELDER QUALIFICATIONS FOR PUMP CONSTRUCTION

A. Welding shall comply with the ASME Boiler and Pressure Vessel Code, Section IX or AWS D1.1. Provide full penetration welds for all butt welds. Open seam butt welds are not permitted. Fabrication, assembly, and erection of pump columns and fabricated discharge heads shall conform to WAS Specification Section 15061.

3.04 FACTORY PERFORMANCE TESTS

A. Each pumping unit shall be subjected to a City-witnessed laboratory performance test. Conduct tests in accordance with the ASME PTC 8.2 or ANSI/HI 2.6, using the actual job driver to be furnished with each pump. The performance test shall be equivalent to ANSI/HI 2.6. Pump acceptance test shall be in accordance with ANSI/HI Table 14.6.3.4, Grade 1U.

B. Pump tests shall be witness tests. Contractor shall include in original bid costs associated for three City Representatives to attend and witness pump factory tests. Contractor shall include costs associated with pump factory testing in original bid. In the event of test failure, Contractor shall provide at his expense additional budget allowing the City Representatives to witness revised factory tests. For testing facilities located farther than 200 miles from the project site, the costs shall include reimbursement for air transportation, car rental, and meals. If overnight stay is required, include the cost of a hotel room. No additional compensation will be due to the Contractor for initial or subsequent factory witness tests.

C. No motor overload above nameplate rating will be allowed at any flow up to 120% of the flow at the BEP.

D. Hydrostatically test columns and discharge heads and cans at design pressure.

E. Deviations and fluctuations of test readings shall conform to ASME PTC 8.2, 1.11 (Type A) or ANSI/HI 2.6, paragraph 2.6.5.4.1.

F. Perform tests and record data, including head, flow rate, speed, vibration and power at a minimum of seven points. These points shall include shutoff, minimum flow, midway between minimum flow and design flow, design flow, 120% of design flow, and maximum flow.

G. The complete pump, including column and discharge elbow, shall be used. Measuring devices shall have been calibrated within the previous year.

SECTION 15650
REFRIGERATION SYSTEMS

PART 1 GENERAL

1.01 SCOPE

This section covers the furnishing and installation of packaged air conditioning units and appurtenances associated with the heating, ventilating, and air conditioning (HVAC) systems.

Piping, pipe supports, valves, and accessories which are not an integral part of the equipment or are not specified herein are covered in other sections.

1.02 GENERAL

Equipment furnished and installed under this section shall be fabricated, assembled, erected, and placed in proper operating condition in full conformity with the drawings, specifications, engineering data, instructions, and recommendations of the equipment manufacturer unless exceptions are noted by Resident Engineer.

A. Coordination

1. Contractor shall verify that each component of the system is compatible with all other parts of the system; that all piping, ductwork, materials, fans, pumps, and motor sizes are appropriate; and that all devices necessary for a properly functioning system have been provided.

2. Where two or more units of the same class of equipment are required, they shall be the product of a single manufacturer; however, all the component parts of the system need not be the products of one manufacturer.

3. Where individual equipment paragraphs specify the requirement for local service, each manufacturer shall have a local service center, or with written consent of Resident Engineer, shall be able to provide service from other locations within 24 hours. The service center shall be equipped and staffed to service the system and shall maintain a local parts supply. Information on equipment manufacturers' representatives shall be included with the submittals.

4. Where several manufacturers' names have been listed in this section as possible suppliers, only the products of the first manufacturer listed have been checked for size, functions, and features.

B. General Equipment Stipulations

1. The General Equipment Stipulations shall apply to all equipment and materials furnished under this section. If requirements in this specification differ from those listed in the sections referenced herein, the requirements specified herein shall take precedence.

C. Governing Standards

1. Except as modified or supplemented herein, all work covered by this section shall be performed in accordance with all applicable municipal codes and ordinances, laws, and regulations. In case of a conflict between this section and any state law or local ordinance, the latter shall govern.

2. All work shall comply with UL safety requirements.

3. The refrigerant systems shall be constructed in accordance with ASHRAE Standard 15. Refrigeration system equipment shall have a minimum efficiency of not less than specified in the latest edition of ASHRAE 90.1, unless otherwise indicated on the drawings.

4. Capacity ratings for condensing units, heat pumps, packaged air conditioning units, and packaged heat pumps with capacities less than 135,000 BTUH shall be in accordance with ARI Standard 210/240. For condensing units, heat pumps, packaged air conditioning units over 135,000 BTUH the capacity ratings shall be in accordance with ARI Standard 360. Capacity ratings for packaged heat pumps with capacities over 135,000 BTUH shall be in accordance with ARI Standard 340.

D. Power Supply

1. Power supply to equipment with motors shall be as indicated in the schedules on the drawings. Power supply for controls shall be 120 volts, 60 Hz, single phase unless otherwise indicated or required for a properly operating system.

E. Metal Thickness

1. Metal thickness and gauges specified herein are minimum requirements. Gauges refer to US Standard gauge.

F. Mechanical Identification

1. Mechanical identification shall conform to the requirements of the basic mechanical building systems materials and methods.

1.03 SUBMITTALS.

A. Drawings and Data

1. Complete assembly and installation drawings, and wiring and schematic diagrams, together with detailed specifications and data covering materials, parts, devices, and accessories forming a part of the equipment furnished, shall be submitted in accordance with the Specification Section 01300, "Submittals". Device tag numbers indicated on the drawings shall be referenced on the wiring and schematic diagrams where applicable. The

data and specifications for each unit shall include, but shall not be limited to, the following:

a) Packaged Air Conditioning Units

i) Name of manufacturer.

ii) Type and model.

iii) Construction materials, thickness, and finishes.

iv) Locations and sizes of field connections.

v) Certified performance data and ratings.

vi) Capacity at specified conditions.

vii) Overall dimensions and required clearances.

viii) Net weight and load distribution.

ix) Multiline wiring diagrams clearly indicating field installed and factory installed wiring with all terminals identified.

x) Electrical requirements including voltage, number of phases, and amperage.

xi) Where specified, information on equipment manufacturers' representatives.

B. Operation and Maintenance Data and Manuals

1. Adequate operation and maintenance information shall be supplied as required in Specification Section 01730, "Operations and Maintenance Manuals". Operation and maintenance manuals shall be submitted in accordance with Specification Section 01300, "Submittals". The operation and maintenance manuals shall be in addition to any instructions or parts lists packed with or attached to the equipment when delivered.

2. The operation and maintenance manuals shall include a listing of all filter locations, types, sizes, and quantities associated with each piece of equipment.

1.04 QUALITY ASSURANCE

A. Quality assurance shall comply with the requirements of the Specification Section 15020, "Basic Mechanical Building Systems Materials and Methods".

1.05 DELIVERY, STORAGE, AND HANDLING

A. Shipping shall be in accordance with Specification Section 01612, "Shipping". Handling and storage shall be in accordance with Specification Section 01614," Handling and Storage".

1.06 EXTRA MATERIALS

A. Extra materials shall be furnished for the equipment as specified in the individual equipment paragraphs.

B. Extra materials shall be packaged with labels indicating the contents of each package. Each label shall indicate manufacturer's name, equipment name, equipment designation, part nomenclature, part number, address of nearest distributor, and current list price. Extra materials shall be delivered to the City as directed.

C. Extra materials subject to deterioration such as ferrous metal items and electrical components shall be properly protected by lubricants or desiccants and encapsulated in hermetically sealed plastic wrapping.

PART 2 MATERIALS

2.01 SERVICE CONDITIONS

A. All equipment shall be designed and selected to meet the specified conditions.

2.02 PERFORMANCE AND DESIGN REQUIREMENTS

Equipment and coil capacities shall be as indicated on the schedules. Where equipment is provided with protective coatings, unit capacities shall be corrected to account for any efficiency losses from the selected protective coating.

For equipment including fans, each fan's operating selection point on the fan curves shall be selected to the right of the peak pressure/efficiency point and below the lowest point along the fan curve, to the left of the peak pressure/efficiency point.

A. Dimensional Restrictions

1. Layout dimensions will vary between manufacturers and the layout area indicated on the drawings is based on typical values of the first manufacturer listed. Contractor shall review the contract drawings, the manufacturer's layout drawings, and installation requirements and shall make any modifications required for proper installation subject to acceptance by Resident Engineer. At least 3 feet of clear access space shall be provided on all sides of the unit unless otherwise indicated.

B. Elevation

1. Equipment shall be designed to operate at the elevation as indicated on the drawings.

2.03 ACCEPTABLE MANUFACTURERS

A. Acceptable manufacturers shall be as listed in the respective product description paragraphs.

2.04 EQUIPMENT

A. Packaged Air Conditioning

Packaged air conditioning units, denoted by the symbol "AC" and an identifying number shall be furnished and installed where indicated on the drawings. Each unit shall be designed for outdoor installation on a full perimeter curb as indicated on the drawings. The packaged air conditioning unit shall be manufactured by Trane "Model TAM", Carrier, McQuay, or York.

The manufacturer of the equipment provided shall have a local service center.

1. Extra Materials

Extra Materials	Quantity
Sets of air filters	2

2. Performance and Design Requirements

a) The units shall be completely factory assembled and tested, piped, internally wired, fully charged with Refrigerant-410A and compressor oil, and shipped in one piece. The unit shall be designed for direct expansion cooling and configured for heating type indicated. The unit shall be suitable for the power supply and shall have the capacities indicated on the drawings.

b) The refrigeration system shall be capable of satisfactory cooling operation at the maximum and minimum outdoor ambient air temperatures indicated on the drawings. Where units need to operate in the cooling mode at a lower temperature than the factory standard as indicated in the schedules on the drawings, a low ambient kit shall be installed. The low ambient kit shall be designed for ambient temperature of 0°F consisting of a solid state controller to vary the speed of the outdoor fan motor in response to refrigerant condensing temperature.

c) Where indicated in the schedules on the drawings, all copper and other surfaces subject to corrosion from the atmosphere indicated shall be given a protective coating.

3. Casing

a) The unit casing shall be of weatherproof design and shall be constructed of 20 gage or heavier zinc-coated steel. The casing shall be properly reinforced and braced for maximum rigidity. The casing shall be given a factory-applied coat of rust-inhibitive primer and shall be provided with the manufacturer's standard baked enamel finish. Interior surfaces of exterior casing members in contact with the airstream shall have 1-inch-thick, 1-pound density, insulation coated on the air side. Aluminum foil-faced glass fiber insulation shall be used in gas fired heating sections. Hinged, insulated, neoprene gasketed access doors or removable panels shall be provided to permit easy inspection and maintenance. Removable insulated access panels shall have aluminum or steel covering on the interior to protect the insulation. The unit base shall be a one-piece, welded assembly with suitable roof curb sealing gasket and curb overhang for water runoff. Drains shall be provided to accommodate outdoor coil runoff.

4. Indoor Coil Section

a) The indoor coil shall be multirow of seamless copper tubing mechanically bonded to heavy-duty aluminum fins. The coil shall be factory leak tested underwater at 200 psig. The coil shall be provided with expansion device or valve, filter-dryer, and moisture indicator. The indoor coil section shall have fully insulated, sloped drain pan extending under the entire coil section and extending sufficiently past the coil to capture and collect any condensate carryover that may be produced when the unit is operating within the specified operating conditions.

5. Filters

a) Filters shall be mounted integral within the packaged air conditioning and shall be 2 inches thick. Hinged access doors shall be provided. Filters shall conform to the requirements in the Heating, and Air Conditioning Systems.

6. Fans and Motors

a) The indoor supply fan shall be forward-curved, multiblade, centrifugal type and shall be statically and dynamically balanced by the fan manufacturer. The fan shall have die-formed, streamlined inlets and the scroll shall be constructed of steel with all seams sealed airtight. The fan shall have steel shafts operating in self-aligning, grease lubricated ball bearings.

b) Units 5 tons and smaller shall have direct or belt driven fans. Where direct driven fans are used, the fan shall have multiple speeds to allow for airflow adjustment. Units greater than 5 tons shall have

V-belt drive with adjustable sheaves and shall be designed for 50 percent overload. The supply fan motor shall conform to the requirements of the Electric Motors paragraph. Vibration isolators shall be provided for the fan assembly and motor assembly.

c) Static pressure values indicated on the drawings are external to the complete unit. Internal coil(s), dampers, filters and fan housing losses are not included. A filter allowance of 0.35-inch water column shall be used for 2 inch pleated filter losses.

d) The outdoor fans shall be direct drive, vertical discharge, propeller type with aluminum blades. Fan motors shall be weatherproof with permanently lubricated ball bearings and built-in thermal overload protection. A corrosion resistant wire guard shall be installed over the fan opening.

7. Compressors

a) Compressors shall be of the reciprocating hermetic, semi-hermetic, or scroll type mounted on vibration isolators. The compressor motor shall have temperature and current sensitive overload protection devices. Each packaged air conditioning unit shall have a minimum number of capacity reduction steps as indicated in the schedules on the drawings.

b) Reciprocating hermetic compressors shall be suction gas cooled with internal pressure relief for high pressure protection, high and low pressure cutout switches, temperature actuated crankcase heater, and automatic reset timer to prevent the compressor from rapid cycling.

c) Reciprocating semi-hermetic compressors shall be suction gas cooled, internal pressure relief for high pressure protection, high and low pressure cutout switches, temperature actuated crankcase heater, oil level sight glass, and automatic reset timer to prevent the compressor from rapid cycling. Capacity reduction shall be provided by automatic suction valve unloaders. Each compressor shall start unloaded.

d) Scroll compressors shall be suction gas cooled with high and low pressure cutout switches and automatic reset timer to prevent the compressor from rapid cycling. The compressor shall have radial and axial compliant scroll plates to allow the compressor to handle liquid slugging without damage to the compressor.

8. Refrigerant Circuit

a) The factory sealed refrigerant system shall consist of compressors, outdoor coils, indoor coils, expansion device, refrigerant dryer, accumulators, refrigerant piping, and a full operating charge of

refrigerant. Units with multiple stages shall have a separate refrigerant circuit for each stage where available as a manufacturer's standard option. Service gauge connections shall be furnished on the suction, discharge, and liquid lines. Units with multiple compressors shall have multiple circuits with separate expansion device, refrigerant dryer, accumulators, compressor, and refrigerant charge. All factory installed gauges, switches, and other devices connected to the refrigerant circuit shall have isolation valves.

9. Outdoor Coil

a) The outdoor coil shall be of the air-cooled integral finned tube type. The coil shall be constructed of copper tubes with aluminum fins permanently and securely bonded to the tubes. The coil shall be factory leak and pressure tested. The coils shall be protected with hail guards.

10. Accessories

a) Where indicated on the drawings, the packaged unit shall be provided with an economizer to automatically utilize up to 100 percent of outside air for cooling. The economizer shall modulate return and outside air dampers to maintain proper discharge temperature into the conditioned space. The dampers shall be equipped with automatic lockout when the outside air conditions are not suitable for proper cooling, and shall have adjustable minimum position control. The damper motor shall be spring return and shall operate to close the outside damper during shutdown. 100 percent relief of the return air shall be provided. The economizer shall be factory installed unless not available as a factory option. Where not available as factory installed, a field installed economizer shall be furnished and installed including damper, hood, controls, and all appurtenances required for a complete installation.

b) Packaged units shall be furnished with a roof mounting curb. The curb shall be constructed of at least 16-gauge zinc-coated steel with nominal 2 by 4-inch wood nailer strip and with supply and return air openings. The curb shall be a minimum of 16 inches high. The curb shall be approved by the National Roofing Contractors Association.

11. Controls

a) Each packaged unit shall be completely factory wired with a single point power connection and factory installed integral disconnect switch. Where a factory installed integral disconnect switch is not available as a standard option, a disconnect switch for field installation on the unit shall be provided. All wiring shall be installed in accordance with the National Electrical Code.

b) Packaged units shall be provided with a factory wired control panel containing full voltage magnetic starters for compressor, outdoor fan, and indoor fan motors, and internal control power transformer.

c) Units with multiple compressors shall have a built-in time delay to prevent both compressors from starting simultaneously.

d) All internal panel wiring shall be neatly run in gutters or bundles to terminal strips for connection of external wiring. All wires and terminal strips shall be numbered or color coded in accordance with the wiring diagram. All internal and external controls, gauges, lights, and switches shall be identified with nameplates. A complete wiring diagram showing the compressor and fan starting circuits and the control circuit shall be furnished.

e) Terminal blocks shall be factory wired to provide terminal points for permissive start for each stage of cooling or cooling and heating from a remotely located control panel or thermostat; terminal points to energize remote dirty filter, heating mode, cooling mode, and service indicating lights; and terminal points to de-energize the unit upon detection of smoke.

f) A thermostat for operation of the unit shall be furnished and installed as indicated and located where indicated on the drawings.

g) The thermostat shall be a cooling only type. The number of cooling stages shall be suitable for the unit control and operation. The thermostat shall have a range of approximately 50 to 95°F. The thermostat shall have a subbase to control system and fan operation.

12. Sound Requirements

a) The packaged unit shall not exceed the maximum sound power level listed below as measured in accordance with AMCA 311. The Supplier shall submit performance data certifying compliance with the acoustical requirements specified herein.

PAC-110 94 dBA

2.05 ELECTRICAL

A. Electric motors and motor controls shall conform to Specification Section 16040, "Electric Motors". Motor starters and controls shall be furnished and installed under the Electrical section, except for equipment specified or furnished with prewired integral starters. Disconnects for equipment shall be furnished and installed under the Electrical section, except where specified with disconnects. All electrical controls shall have enclosures suitable for the environment and NEMA rating as indicated on the electrical drawings. Equipment installed outdoors shall have NEMA Type 4 enclosures.

2.06 DRIVE UNITS

A. Electric motors, V-belt drives, and safety guards shall be in accordance with the requirements of Specification Section 15050, "Basic Mechanical Systems Materials and Methods".

2.07 MANUFACTURE AND FABRICATION

A. Manufacture and fabrication shall comply with the requirements of Specification Section 15050, "Basic Mechanical Systems Materials and Methods".

2.08 SHOP TESTING

A. The equipment furnished under this section shall be tested at the factory according to the standard practice of the manufacturer. Ratings shall be based on tests made in accordance with applicable AMCA, ASHRAE, ARI, NBS, NFPA, and UL Standards.

2.09 BALANCE

A. All rotating parts shall be accurately machined and shall be in as nearly perfect rotational balance as practicable. Excessive vibration shall be sufficient cause for rejection of the equipment. The mass of the unit and its distribution shall be such that the resonance at normal operating speeds is avoided. In any case, the maximum measured root-mean-square (rms) value as measured at any point on the equipment shall not exceed those listed in the latest ASHRAE Applications Handbook.

B. At any operating speed, the ratio of rotative speed to the critical speed of a unit or components thereof shall be less than 0.8 or more than 1.3.

PART 3 EXECUTION

3.01 INSPECTION

A. Equipment installed in facilities with limited access shall be suitable for being installed through available openings. Contractor shall field verify existing opening dimensions and other provisions for installation prior to submittal of bids.

3.02 PREPARATION.

A. Field Measurement

1. Contractor shall be responsible for verifying all field dimensions, and for verifying location of all equipment relative to any existing equipment or structures.

B. Surface Preparation

1. All surfaces to be field painted shall be dry and free of dirt, dust, sand, grit, mud, oil, grease, rust, loose mill scale, or other objectionable substances, and shall meet the recommendations of the paint manufacturer for surface preparation. Cleaning and painting operations shall be performed in a manner which will protect freshly painted surfaces from dust or other contaminants. Oil and grease shall be completely removed by use of solvents or detergents before mechanical cleaning is started. The gloss of previously painted surfaces shall be dulled if necessary for proper adhesion of top coats.

2. Surface finish damaged during installation shall be repaired to the satisfaction of Resident Engineer. Field painting shall be as specified in Specification Section 09900, "Painting and Coating".

3.03 INSTALLATION

Equipment and materials furnished under this section shall be installed in proper operating condition in full conformity with the drawings, specifications, engineering data, instructions, and recommendations of the equipment manufacturer, unless exceptions are noted by Resident Engineer.

The space beneath the baseplate shall be grouted as specified in Specification Section 03600, "Grout".

A. Valves

1. Valves shall be installed with their stems horizontal or vertical and above the valve body and with the applicable requirements of the valve sections.

B. Packaged Air Conditioning Units

1. The packaged air conditioning units shall be installed in accordance with the manufacturer's installation instructions. Each unit shall be leveled and installed to maintain the manufacturer's recommended clearances. The units shall be firmly anchored to the equipment curbs with corrosion resistant fasteners.

3.04 FIELD QUALITY CONTROL

A. Installation Check

a) An installation check by an authorized representative of the manufacturer is not required for equipment specified in this section.

B. Startup and Testing

a) After the equipment and systems have been installed, adjusted, and balanced, tests shall be conducted to demonstrate that each

system is functioning as specified and to the satisfaction of Resident Engineer. Tests shall be as indicated in Specification Section 01650, "Startup Requirements".

b) If inspection or tests indicate defects, the defective work or material shall be replaced, and inspection and tests repeated. All repairs to piping shall be made with new materials. Caulking of threaded joints or holes will not be acceptable

3.05 CLEANING

A. At the completion of the testing, all equipment, pipes, ductwork, valves, and fittings shall be cleaned of grease, debris, metal cuttings, and sludge. Any stoppage, discoloration, or other damage to parts of the building, its finish, or furnishings shall be repaired by Contractor at no additional cost to the City.

END OF SECTION

SECTION 15900

BUILDING AUTOMATION SYSTEM

PART 1 GENERAL

1.1 SECTION INCLUDES

A. This section includes the specification for development of the Building Automation System (BAS). The BAS system architecture utilizes intelligent distributed control modules, located throughout the building, that communicate over a BACnet™ controller network and whose controlling software resides on a central server connected to the campus Ethernet® LAN (Primary LAN).

B. It is the intent of this section to provide, install, connect, program, and calibrate the additions and/or modifications to the BAS as necessary to provide fully automatic control for all systems as shown in the control drawings, stated in the sequences of operation. Some equipment controls are specified in other portions of the subcontract documents. As work of this section, coordinate with these other suppliers and trades to provide a complete BAS.

C. It is the responsibility of the bidder to read and conform to all sections of the specifications, review all subcontract drawings of all divisions, and coordinate with all equipment suppliers of material specified under other sections of the specifications.

D. The engineering, installation supervision, programming, graphic development, calibration, start up, and checkout necessary for a complete and fully operational BAS, as specified hereafter, shall be provided under this section.

E. Provide training and instruction of the installed BAS.

F. Provide the necessary materials and manpower to participate in the testing, adjusting, and balance and the commissioning process as required by those sections of the specification.

1.2 RELATED SECTIONS

A. Section 13851 – Fire Detection and Alarm

B. Section 15075 – Identification for Plumbing, HVAC, and Fire piping and Equipment

C. Section 16130 – Raceway and Boxes for Electrical Systems

D. Section 16120 – Low Voltage Electrical Power Conductors and Cables

E. Section 16075 – Identification for Electrical systems

1.3 SUBMITTALS

A. Submit the following in accordance with the requirements of Section 01330, Submittal Procedures:

1. With Bid: BAS system manufacturer and subcontract information for local installing subcontractor and factory representative. Failure to comply with the specified requirements of this section will result in rejection of submittal.

2. Submittals shall consist of shop drawings, catalog data sheets, graphic displays, and software development parameters as defined in the following paragraphs. No materials shall be purchased and no work shall be conducted at the job site until submittals have been reviewed and approved.

   a. Shop drawings shall be provided that show detailed communications architectures (including connection to the City of San Diego, California network control devices, electrical ladder diagrams, control system schematics, approved protocol implementation compliance statements (PICS), sequences of operation, and a material list. These same sequences of operation shall also be provided as a separate document from the drawings in either Microsoft Word or PDF format. All systems and the associated control components as well as all connections between components shall be clearly indicated. The submittal shall indicate the required coordination with equipment supplied by sources other than this section. The intention is for the shop drawings to be comprehensive enough for the installation crew to complete all aspects of the installation without the need for supporting documentation, except third party equipment installation manuals. All wiring shown on the drawings shall be labeled on both ends and these labels shall be used in the installation process for ease of comparing the shop drawings to the actual field installation. Each control component shall be given a unique identifier. This identifier shall be used in creating equipment field device labels and in the sequence of operation so that each device can be matched uniquely to the drawings.

      i. Electrical Ladder Diagrams shall be shown on the shop drawings. Electrical ladder diagrams shall show the specific details of all switches, relays, motor starters, etc. The electrical ladder diagrams shall show the correct control wiring and interlock wiring of all equipment provided under the Subcontract. Each diagram shall reference the correct power source by breaker panel and circuit number.

ii. The sequence of operation for each controlled system shall be provided with reference to the control device identifier. The sequence of operation shall break down the control operation by major function (e.g., mixed air control, occupied-unoccupied, smoke purge, etc.) and describe in detail the correct operation and interaction with other system functions. Use of the sequences of operation stated on the subcontract control drawings is acceptable; however, they shall be modified to reflect actual control device identifiers. Point list tables shall be included to describe alarm, monitoring, interlock, and other general functions.

iii. A complete material listing shall be included on the shop drawings that show the device model numbers, control device identifiers, quantities, manufacturers, etc., of all equipment provided under this section. The material list shall be organized in alphabetical order so that it can be easily compared to the associated catalog data sheets.

b. Catalog data sheets shall be provided for each different piece of equipment provided under this section. At a minimum the data sheet shall contain sufficient information so that compliance with the specification can be verified. Where multiple models or options are indicated on the same catalog data sheet, the equipment proposed shall be circled or otherwise indicated (highlighter is not acceptable because of copy quality). The catalog data sheets shall be organized in alphabetical order to match the material listing on the shop drawings.

c. Point verification and sensor calibration forms shall be submitted for all points and sensors that are installed as part of the BAS. This includes all points connected to unitary controllers (UCs). Once approved, the Subcontractor shall complete the forms during startup to document successful point functionality and sensor calibration. The completed forms shall be included as part of the record documentation. The City of San Diego, California Engineering and Capital Improvements Department reserves the right to designate a representative to monitor completion of the point verification.

d. All graphic slides (or typical graphics for identical equipment) proposed for use on this project shall be submitted for review and approval. The submitted slides shall be printed in color or submitted electronically as a PDF or other commonly viewable format. All real-time display fields, user picks, set point picks, etc. shall be clearly indicated. No graphic software shall be installed on the job site until the graphic slides have been approved.

e. Software development parameters including all trend logs, reports, point alarm parameters, passwords, and scheduling shall be submitted based on the contents of this specification section. The information contained in this portion of the submittal shall be followed during development of the programming code and shall be used for evaluation of the systems performance during the commissioning phase.

i. Report templates shall indicate what information will be presented on each report, how the information will be presented, report hard disk upload parameters, and report log file names.

ii. Blank forms shall be submitted for completion of password information by The City of San Diego, California Engineering and Capital Improvements Department. The forms shall allow the The City of San Diego, California Engineering and Capital Improvements Department to fill in the operators name and approved password level. During Engineering and Capital Improvements Department personnel training, the BAS programmers shall coordinate with the approved operators to input the correct passwords and password levels.

iii. Blank schedule forms for each air-handling unit shall be submitted for completion by the Engineering and Capital Improvements Department. Additionally, a blank schedule group form template shall be submitted so the Engineering and Capital Improvements Department can identify schedule groups of HVAC equipment.

f. Provide detailed operation sequences for all variable frequency drives including required ramp up/down speeds, accelerations, resets, and deadbands.

1.4 QUALITY ASSURANCE

A. Qualification of the Installing Firm: The installing firm shall:

1. Have satisfactorily installed at least five (5) BAS systems of equivalent nature and scope to the system described in this Section.

2. BAS supplier shall have an authorized factory representative and service department of the product manufacturer within 125 miles of City of San Diego, California.

3. Provide the services of a qualified system technician to design the system and to test the completed system.

4. Be a factory-certified representative of the manufacturer of the system that will be used on this project.

B. Acceptable Building Automation System Installers:

1. The following Factory Authorized Installers have demonstrated their capabilities to provide a BAS meeting City of San Diego, California standards and the criteria herein (no substitutions).

a. Integrated Control Systems, Inc. [Automated Logic]

b. Automated Control Systems, Inc. [Alerton Technologies]

C. Qualifications of the BAS system technician: The BAS system technician shall:

1. Be factory trained in the theory, operation, installation, and troubleshooting of the BAS that will be used for this project.

2. Have satisfactorily designed at least five (5) BAS systems of equivalent nature and scope to the system described in this Section.

3. Have satisfactorily field-tested at least five (5) BAS systems of equivalent nature and scope to the system described in this Section.

1.5 RECORD DRAWINGS

A. Record drawings shall be provided as required by the general Subcontract requirements. Record drawings shall not be completed until after installation is complete. Any changes made during installation shall be recorded as red-lines on the approved coordinated BAS shop drawings as they are made. These red-line drawings shall be available at all times for inspection by The City of San Diego, California Engineering and Capital Improvements Department. At completion of the project, all hand drawn field changes shall be incorporated into a clean reproducible set of as-built drawings. These as-built drawings shall be provided to The City of San Diego, California Engineering and Capital Improvements Department electronically (current AutoCAD format) and used during the training sessions.

B. The Subcontractor shall furnish complete spare parts lists, operating instructions, maintenance literature, and completed point verification and sensor calibration forms.

C. Two (2) sets of the following documents shall be delivered to the The City of San Diego, California Engineering and Capital Improvements Department prior to the beginning of training:

1. One operating manual for each component purchased through a third-party vendor including equipment such as computers, printers, video monitors, interface cards, modems, etc.

2. All manuals relating to operating system software. This requirement includes not only the BAS operating software but also Windows 10®, etc.

3. A systems programmer's manual that includes all information necessary to perform BAS programming and produce system graphics.

D. After final occupancy and all debugging have occurred, the Subcontractor shall prepare two copies of all project-specific control software on non-volatile computer recording media (CD) and deliver them to The City of San Diego, California Engineering and Capital Improvements Department.

E. License agreements for all supplied software shall be provided.

F. Licensed copies of all specialty software needed for controlled configuration.

1.6 SYSTEM TESTING

A. At the termination of the point verification and sensor calibration process, the Subcontractor shall submit completed and approved point verification and calibration forms for each point or sensor in the system.

B. Upon successful completion of all point verification and sensor calibration testing, the Subcontractor shall submit hard copies of all trend logs as specified in PART 3 of this section. The trend logs shall trend at least 48 hours of normal uninterrupted operation (non-weekend or holiday) for the purpose of documenting proper implementation of the control sequences of operation. The control sequence of operation shall also be verified by the completion of a Sequence of Operation (SOO) commissioning checkout form in accordance with the example supplied by The City of San Diego, California Engineering and Capital Improvements Department.

C. The City of San Diego, California Engineering and Capital Improvements Department reserves the right to participate in or assign a representative to participate in the startup, testing, programming, or any other aspect of the construction of this project at no additional cost to The City of San Diego, California. In general, the FPT shall be observed by a member of the ES-DE I&C Team who will deliver a punch-list delineating the deficiencies found in the BAS.

D. The Subcontractor shall be responsible for developing and implementing a Pre-Operational Acceptance Test (POAT) before Functional Performance Testing (FPT) begins. This test shall verify the point-to-point wiring, calibration, field device operation, and basic functionality of the BAS. The Subcontractor is responsible for back-checking and documenting his own work before a system or portion of a system is observed for FPT.

E. The Subcontractor shall perform and otherwise support the FPT provided by the commissioning agent.

1.7 TRAINING

A. Provide a total of 80 hours of training time.

B. During the initial startup phase of the project, the BAS supplier shall permit The City of San Diego, California operating personnel to be involved with the troubleshooting, initial startup, point verification testing, performance trending and sequence of operations verification.

C. Prior to the final system trending, provide three days (20 hours) of training for up to six (6) The City of San Diego, California -designated operating personnel, at least one of which shall be from City of San Diego plant operations, or their designee. The training shall cover all general aspects of the BAS system installation, wiring, calibration techniques, programming, troubleshooting, etc. The training shall not cover the details of this specific project. The training shall

provide the same structure and depth as that provided to a factory authorized representative's installation and programming personnel.

D. Upon completion and acceptance of the work, provide three days (20 hours) of training for up to six (6) The City of San Diego, California -designated operating personnel who have responsibility for the mechanical/control system. This training shall be conducted on site and shall focus on the specifics of this project. A complete training booklet shall be provided and used during the training period. The booklet shall include the as-built drawings and the sequence of operations.

E. The BAS supplier shall provide 40 additional hours of onsite training during the warranty period. The Subcontractor shall provide this training at the request of The City of San Diego, California. The City of San Diego, California will give at least one-week notice of the need for additional training. Warranty and service time shall not constitute training hours.

1.8 SERVICE AND WARRANTY

A. The system supplier shall have a maintenance support facility complete with system technicians, diagnostic and test equipment, and new spare components. Emergency service shall be available in the local office on a 24-hour, 7-day-a-week basis. The service agent shall provide a continuously monitored local service telephone number for emergency service.

B. Service and maintenance shall be provided for one (1) year from time of substantial completion or from successful completion of the SOO functional testing, whichever is later. If the manufacture has a standard warranty that exceeds the specified requirement then the longer manufacturers warranty shall be provided to The City of San Diego, California. Service during this period shall be available within 12 hours from the time the trouble call is placed. Warranty shall be for all materials and labor provided as the scope of work of this Section.

PART 2 PRODUCTS

2.1 PRODUCT OPTIONS AND SUBSTITUTIONS

A. Comply with Section 01630, Project Options and Substitutions.

2.2 NETWORKING / COMMUNICATIONS

A. Primary Local Area Network (LAN).

1. Provide a connection to the primary ETHERNET® LAN communication network.

2. The only BAS equipment connections to the Primary LAN are the BAS Gateways or Web Interfaces. IP addresses for these devices shall be assigned by The City of San Diego, California Network Engineering. All other

BAS hardware shall reside on either the Controller LAN or the Sub-Controller LAN.

3. All BAS devices that reside on the Primary LAN shall communicate in BACnet™ encoded to be compatible with the ETHERNET® and shall connect to an existing SAN DIEGO BAS server running a single copy of the controlling software. BAS devices that communicate using proprietary protocols or LonTalk protocols are unacceptable.

B. Controller Local Area Network (LAN).

1. All BAS Primary Controllers, Application Specific Controllers, and Unitary Controller Interfaces within a specific building shall reside on the second tier LAN referred to as the Controller LAN. The Controller LAN shall begin at the building BAS Gateway and extend to one or more BAS Controller LAN controllers located throughout the building.

2. Development of the Controller LAN is work provided entirely under this section of the specification.

3. All BAS Devices that reside on the Controller LAN shall communicate in BACnet™. Proprietary or LonTalk protocols shall not be permitted except for VFDs that may be connected using a LonTalk or Modbus™ network.

C. Sub-Controller Local Area Network.

1. All lower-level controllers associated with each Unitary Interface Controller shall reside on the third-tier LAN referred to as the Sub-Controller LAN.

2. Unitary Controllers (UCs) shall be installed on a Sub-Controller LAN. These LAN's shall operate off the associated Unitary Controller Interface but in no case shall the Sub-Controller LAN be necessary for standalone operation of any attached UC.

3. All BAS Devices that reside on the Sub-Controller LAN shall communicate in BACnet™. Proprietary or LonTalk protocols shall not be permitted except for VFDs that may be connected using a LonTalk or Modbus™ network.

4. The Sub-Controller LAN shall operate using RS-485 at a selectable speed of from 9.6K to 115.2K baud. Development of the Sub-Controller LAN is work provided entirely under this section of the specification.

2.3 BACNET™ COMPLIANCE

A. The BAS system shall utilize BACnet™ communications between all controllers on the controller LAN as defined by ANSI/ASHRAE Standard 135-2001. This means that the system shall use BACnet™ as the communication protocol between distributed controllers communicating on the Controller LAN and that proprietary or LonWorks protocols are not acceptable except for communication

with VFDs. The BACnet™ communication protocol shall, at a minimum, support the following Objects and Application Services (Conformance Class 3):

Objects >	Binary Input	Services >	Read property
	Binary Output		Write property
	Binary Value		I-Am
	Analog Input		I-Have
	Analog Output		Read Multiple Property
	Analog Value		Write Multiple Property
	Calendar		Who-Has
	Schedules		Who-Is

B. The communication network between controllers (Controller LAN) shall be EIA-485, at least 78.4kbps, using either MS/TP or 156K baud using ARCNET® at the Data Link Layer or shall be ETHERNET®. Systems that use proprietary protocol for the main controller field bus are not acceptable.

2.4 CENTRAL BAS WORKSTATION SERVER

A. The SAN DIEGO BAS Workstation server and as appropriate, web appliance, for this project shall be installed in coordination with The City of San Diego, California I&C Team. The operating system on these servers shall be Windows 2000 Server (or better), and are maintained by a The City of San Diego, California IT support group. The operating system on web appliances, if different from Windows 2000 Server, shall be maintained by the controls vendor in cooperation with The City of San Diego, California IT support group. The BAS control software on these servers is maintained by The City of San Diego, California IT support group. All necessary software or server/appliance upgrades and database consolidation required for this new project to integrate with other existing projects from this same controls vendor shall be provided by the Controls Subcontractor. The intent here is to utilize the existing central servers/appliances and integrating the new building databases on the server/appliance whenever possible.

B. If the capacity of the existing The City of San Diego, California IT support group (San Diego)server or appliance for this vendor would be exceeded by the addition of this new project, provide one new rack mountable server. This server shall be consistent with current IT support server specifications, including all necessary hardware and software requirements described by the IT support group and as indicated on the Subcontract Drawings and as required for a fully functional system. New appliances shall also be rack mountable if such a version exists.

C. Web Based Graphical User Interface Software (GUI)

1. The Graphical User Interface (GUI) shall be a comprehensive software package, a 32-bit application completely compatible with The City of San Diego, California IT support group BAS server Operating system if it resides on the server, or shall reside separately on a vendor-supplied web appliance.

GUI's that use a modified Windows Operating System (OS) are not acceptable.

2. The GUI shall be installed on the appropriate San Diego BAS server or web appliance and available on the SAN DIEGO intranet (Primary LAN) using a standard web browser compliant with current San Diego standards. The web interface GUI shall have monitor and control, setpoint change, and scheduling capability to all points of the BAS system. Access to these functions shall be controlled by password level, defined later in this section. Engineering functions (graphics generation and programming) are not available through the GUI and are described in following sections.

3. The GUI shall make extensive use of color to communicate information and shall graphically display in 1024 by 768 pixels 24-bit True Color.

4. The GUI software shall minimize operator training through the use of English language prompting, English language point identification, and industry standard PC application software.

5. The operator interface shall minimize the use of a typewriter style keyboard through the use of a mouse or similar pointing device, and "point and click" approach to menu selection. The users shall be able to start and stop equipment, change schedules, change setpoints, and create/view trends from graphic displays through the use of a mouse.

6. At the option of the user, the GUI shall provide consistent graphical or text-based displays of all system points and application data described in this specification. Point identification, engineering units, status indication, and application naming conventions shall be the same at all operator devices.

7. User-definable, automatic log-off timers of from 1 to 60 minutes shall be provided to prevent operators from inadvertently leaving devices on-line.

D. Password protection:

1. Multiple-level password access protection shall be provided to allow the user/manager to limit workstation control, programming access, display and database manipulation capabilities as deemed appropriate for each user, based upon an assigned password. A minimum of five (5) levels of access shall be supported and a minimum of 50 passwords shall be supported.

2. Operators shall be able to perform only those commands available for their respective passwords. Menu selections displayed at any operator device, including portable or panel mounted devices (future), shall be limited to only those items defined for the access level of the password used to log-on.

E. System Interaction

1. The operator interface (Web based GUI) shall allow the operator to perform commands within any BAS controller on the BAS local area network including, but not limited to, the following:

    - Start-up or shutdown of all equipment converted to the BAS.
    - Adjust, override, and release setpoints
    - Add/Modify/Delete programming
    - Enable/Disable process execution
    - Limit setpoint adjustment range of zone sensors.
    - Lock/Unlock alarm reporting for each point
    - Enable/Disable Totalization for each point
    - Enable/Disable Trending for each point
    - Enter temporary override schedules
    - Define Holiday Schedules
    - Change time/date
    - Enter/Modify analog alarm limits
    - Enter/Modify analog warning limits
    - View limits

2. All control strategies and energy management routines shall be definable by the operator. System definition and modification procedures shall not interfere with normal system operation and control.

3. The system shall be provided complete with all equipment and documentation necessary to allow an operator to independently perform the following functions:

    - Add/Delete/Modify standalone BAS panels
    - Add/Delete/Modify application specific controllers
    - Add/Delete/Modify points of any type, and all associated point parameters, and tuning constants
    - Add/Delete/Modify alarm reporting definition for each point
    - Add/Delete/Modify control loops
    - Add/Delete/Modify energy management applications
    - Add/Delete/Modify time- and calendar-based programming
    - Add/Delete/Modify totalization for every point
    - Add/Delete/Modify historical data trending for every point
    - Add/Delete/Modify custom control processes
    - Add/Delete/Modify any and all graphic displays, symbols, and cross-references to point data
    - Add/Delete/Modify all operator passwords
    - Add/Delete/Modify alarm messages

4. Definition of operator device characteristics, BAS panels, individual points, applications and control sequences shall be performed through fill-in-the-blank templates.

F. Reports

1. Reports shall be generated automatically or manually, and accessed via operator input to GUI monitors, printers, or disk files. As a minimum, the system shall allow the user to easily obtain the following types of reports:

    - A general listing of all points in the network
    - List all points currently in alarm
    - List of all off-line points
    - List all points currently in override status
    - List of all disabled points
    - List all points currently locked out
    - List of all items defined in a "Follow-Up" file
    - List all weekly schedules
    - List all holiday programming
    - List of limits and deadbands

2. Summaries shall be provided for specific points, for a logical point group, for a user-selected group of groups, or for the entire facility without restriction due to the hardware configuration of the BAS.

G. Third Party Software Interface

1. System data, including transactions, alarms, totalization files, etc., shall be stored on the San Diego BAS server hard drive in a format compatible with Microsoft database and spreadsheet programs.

H. Dynamic Color Graphic Displays

1. Software for development of BAS color graphic site plans, buildings, building floor plan displays, and system schematics for each piece of mechanical equipment, including air handling units, chilled water systems, hot water boiler systems, and all other controlled or monitored systems shall be provided as specified in PART 3 of this specification.

2. Dynamic point (actual or calculated) indication shall be shown in their respective locations, and shall automatically update to represent current conditions without operator intervention.

I. Database Save/Restore/Back-Up

1. Back-up copies of all standalone BAS panel databases shall be stored on the appropriate San Diego BAS server. The subcontractor shall backup all affected databases each day after modifications are made.

2. Continuous supervision of the integrity of all BAS panel databases shall be provided. In the event that any BAS panel on the network experiences a loss of its database for any reason, the system shall automatically download a the

latest updated copy of the respective database to restore proper operation. Database back-up/download shall occur without operator intervention. Operators shall also have the ability to manually execute uploads and downloads of any or all portions of a BAS panel database to or from the appropriate San Diego BAS server.

J. Graphics Generation Software

1. Graphics generation software shall be provided to allow the engineering user to add, modify, or delete system graphics displays.

2. A complete standard library of pre-engineered screens and symbols depicting standard air handling unit components (e.g. fans, cooling coils, filters, dampers, etc.), complete mechanical systems (e.g. constant volume-terminal reheat, VAV, etc.), instrument, and electrical symbols shall be provided.

3. The graphics development package shall use a mouse in conjunction with a drawing program to allow the user to perform the following:

    - Define symbols
    - Position and size symbols
    - Define background screens
    - Define connecting lines and curves
    - Locate, orient and size descriptive text
    - Define and display colors for all elements
    - Establish correlation between symbols or text and associated system points

K. Graphics Programming Software

1. A Graphics Programming Language (GPL) software package shall be provided that allows fully graphic programming of all BAS control algorithms resident in BAS controllers. Any system that does not use a drag and drop method of graphical icon programming as described herein shall be unacceptable.

2. The following is a definition listing for the capabilities described for the Graphics Programming software:

    a. Function Block (FB) - Shall be a collection of points, micro-blocks and wires that have been connected together for the specific purpose of controlling a piece of HVAC equipment or a single mechanical system.

    b. Logical I/O - Input/Output points that shall interface with the control modules in order to read various signals and/or values or to transmit signal or values to controlled devices.

    c. BACnet™ Points - points that comply with the BACnet™ structure as defined in the same standard.

    d. Microblocks - software devices that are represented graphically and may be connected together to perform a specified sequence.

e. Wires - graphical elements that are used to form logical connections between microblocks and between microblocks and logical I/O. Different wires types shall be used depending on whether the signal they conduct is analog or digital.

f. Labels - shall be similar to wires in that they are used to form logical connections between two points. Labels shall form a connection by reference instead of a visual connection, e.g. two points labeled '"A" on a drawing are logically connected even though there is no wire between them.

g. Parameter - shall be a value that may be tied to the input of a microblock. Each parameter shall then be displayed on the resulting FB parameter page and can be modified to varying degrees based upon the appropriate password level being used by the operator. Different parameter microblocks shall be used depending on whether the parameter is digital or analog.

h. Constant - shall be similar to a parameter except that it is displayed only in the graphics FB file itself and not be displayed on any parameter page. Certain coefficients that are used in various calculations always remain constant and therefore should be constants that are embedded in the program and not parameters. Different constant microblocks shall be used depending on whether the constant is digital or analog.

i. Properties - Dialog boxes shall appear after a microblock has been inserted that has editable parameters associated with it. Default parameter dialog boxes shall contain various editable and non-editable fields and shall contain push buttons for the purpose of selecting default parameter settings.

j. Icon - shall be graphic representation of a software program. Each graphic microblock has an icon associated with it that graphically describes it function.

k. Menu-bar Icon - an icon that is displayed on the menu bar on the GPL screen that represents its associated graphic microblock.

    i. GPL is a method used to create sequences of operations by assembling graphic microblocks that represent each of the commands necessary to complete a control sequence. Microblocks represent common logical control devices used in conventional control systems, such as relays, switches, high signal selectors, etc., in addition to the more complex BAS and energy management strategies such as PID loops and optimum start. Each microblock shall be interactive and contain the programming necessary to execute the function of the device its represents.

    ii. Graphics programming shall be performed while on screen. Each microblock shall be selected from a microblock library and assembled with other microblocks necessary to complete the specified sequence. Microblocks are then interconnected on

screen using graphic "wires", each forming a logical connection. Once assembled, each logical grouping of microblocks and their interconnecting wires forms a graphic function block that may be used to control any piece of equipment with a similar point configuration and sequence of operation.

iii. The clarity of the graphics sequence shall be such that the user has the ability to verify that system programming meets the specifications, without having to learn or interpret a manufacturer's unique programming language. The graphic programming shall be self-documenting and provide the user with an understandable and exact representation of each sequence of operation.

iv. Full simulation capability shall be provided with the GPL. Users shall be able to fully simulate the constructed sequence on screen before the sequences are downloaded into the controllers. The GPL shall also include the ability to simulate multiple graphic programs communicating with each other on a simulated network. The simulation shall show each output value and how it varies in relation to an artificial time clock. The time clock may run at normal time increments, increased increments (fast motion) or decreased increments (slow motion).

2.5 GATEWAY CONTROLLERS (GWC)

A. The Gateway Controller (GWC) shall be a microprocessor-based communications device that functions as a communications gateway/router between a Controller LAN and the Primary LAN. It shall be capable of acting as a bridge and router between designated BACnet™ data links and the ARCNET data link. It shall offer PTP to ARCNET and BACnet/IP to ARCNET routing capability.

B. The Primary LAN that connects GWCs in other buildings exists and development of that LAN is not work of this section. The Primary LAN is configured as an Ethernet 10/100Base-T (10 or 100Mbps) or Gigabit Ethernet (future) network operating over fiber-optic cable. In the case of Ethernet connections, the LAN Gateway may be configured as Ethernet 10/100Base-T(10/100Mbps), and shall be CAT5 or current industry standard cable that exceeds CAT5 specifications

C. Each GWC shall support a building Controller LAN on which shall reside Primary Controllers, Application Specific Controllers, or Unitary Controller Interfaces.

D. The Controller LAN shall use the BACnet™ communication protocol. The communication between controllers shall be at least 156 Kbps using ARCNET implemented over EIA-485 at the Data Link Layer.

E. The GWC shall provide two EIA-232 ports that can be connected to future portable computers or modems.

F. The GWC shall provide full arbitration between multiple users, whether they are communicating through the same or different GWCs.

G. The GWC shall be responsible for routing global information from the various building Controller LAN's that may be installed throughout a building or multiple buildings.

H. The GWC shall utilize FLASH memory that allows firmware updates to be performed remotely.

2.6 PRIMARY BAS CONTROLLERS (PFC)

A. Primary BAS Controllers (PFCs) shall be provided where larger non-application specific I/O is installed. Such applications could include central chiller plants, boiler plants, larger built up air handling units with special point and software requirements. PFCs shall reside on the Controller LAN and their point information shall be fully accessible by the GWC

B. PFCs shall use the BACnet™ communication protocol for communication with all other Controller LAN controllers and shall, at a minimum, support the following Objects and Application Services (Conformance Class 3):

Objects >	Binary Input	Services >	Read property
	Binary Output		Write property
	Binary Value		I-Am
	Analog Input		I-Have
	Analog Output		Read Multiple Property
	Analog Value		Write Multiple Property
	Calendar		Who-Has
	Schedules		Who-Is

C. Each PFC shall be capable of standalone direct digital operation utilizing its own 32-bit processor, non-volatile flash memory, input/output, 12-bit A-to-D conversion, hardware clock/calendar, and voltage transient and lightning protection devices. All non-volatile flash memory shall have a battery backup of at least five years. Firmware revisions to the module shall be able to be made from the San Diego BAS server, portable operator terminals (future), or from remote locations over modems or LANs.

D. Each PFC shall be expandable to the specified I/O point requirements and shall accommodate multiple I/O Expander Modules via a designated expansion I/O bus port. These expander modules shall expand the total point capacity of each controller up to 192 points where specified. The controller, in conjunction with the expansion modules, shall act as one standalone controller. The Subcontractor shall provide 30% spare hardware I/O capacity.

E. All point data, algorithms, and application software within a PFC shall be custom programmable from the Web based GUI with appropriate password level.

F. Each Primary BAS Controller shall execute application programs, calculations, and commands via a 32-bit microcomputer resident in the controller. All operating parameters for application programs residing in each PFC shall be stored in read/writable nonvolatile flash memory within the PFC and shall be able to upload/download to/from the San Diego BAS server via the Web based GUI with appropriate password level.

G. Each PFC shall include self-test diagnostics that allow the PFC to automatically relay to the GWC any malfunctions or alarm conditions that exceed desired parameters as determined by programming input.

H. PFCs shall contain both software and firmware to perform full DDC PID control loops.

I. Each PFC shall contain a serial or USB port for the interface of maintenance personnel's portable computer (future). All network interrogation shall be possible through this port.

J. Input-Output Processing:

1. Digital outputs shall be relays, 24VAC or VDC maximum, 3 amp maximum current. Each configured as normally open or normally closed using jumpers and either dry contact or bussed. Triac outputs are unacceptable. Each output shall have a manual Hand-Off-Auto switch, to allow for override and an LED to indicate the operating mode of the output.

2. Universal inputs shall be Thermistor (BAPI Curve II) 10K Ohm at 77EF (25EC), 0-5VDC, 10K Ohm maximum source impedance, 0-20mA - 24 VDC loop power 250 Ohm input impedance, dry contact - 0.5mA maximum current.

3. Analog output shall be electronic, voltage mode 0-10VDC or current mode 4-20mA.

4. Analog pneumatic outputs shall be 0-20psi. Each pneumatic output shall have a feedback transducer to be used in the system for any software programming needs. The transducer shall measure the actual psi output value and not a calculated value. Each output shall have a manual override switch that shall allow each output to be configured in one of three ways: open, closed, or automatic operation. An LED shall indicate the state of each output.

2.7 APPLICATION SPECIFIC CONTROLLERS

A. Application Specific Controller (ASCs) shall be provided where small application-specific I/O is installed. Such applications include packaged rooftop equipment, packaged chiller controllers, and exhaust fan control. Multiple Application Specific Controllers (ASCs) shall not be employed to substitute for a single PFC.

ASCs shall reside on the Controller LAN and their point information shall be fully accessible by the GWC.

B. The ASC shall use the BACnet™ communication protocol to communicate with all other Controller LAN controllers and shall, at a minimum, support the following Objects and Application Services (Conformance Class 3):

Objects >	Binary Input	Services >	Read property
	Binary Output		Write property
	Binary Value		I-Am
	Analog Input		I-Have
	Analog Output		Read Multiple Property
	Analog Value		Write Multiple Property
	Calendar		Who-Has
	Schedules		Who-Is

C. Each ASC shall be capable of stand-alone BAS operation utilizing its own 32-bit processor, nonvolatile flash memory, input/output, 10-bit A-to-D conversion, hardware clock/calendar, and voltage transient and lightning protection devices. All nonvolatile Flash memory shall have a battery backup of at least five years. Firmware revisions to the module shall be made from the SAN DIEGO BAS server, Web based GUI.

D. All point data, algorithms, and application software within the ASCs shall be custom programmable from the Web based GUI.

E. Each ASC shall execute application programs, calculations, and commands via a 32-bit microcomputer resident in the controller. All operating parameters for the application program residing in each ASC shall be stored in read/writable nonvolatile flash memory within the ASC and shall be able to upload/download to/from the San Diego BAS server via the Web based GUI with appropriate password level.

F. Each ASC shall include self-test diagnostics that allow the ASC to automatically relay to the GWC any malfunctions or alarm conditions that exceed desired parameters as determined by programming input.

G. Each ASC shall contain both software and firmware to perform full DDC PID control loops.

H. A serial or USB port shall be provided for the interface of maintenance personnel's portable computer. All network interrogation shall be possible through this port.

I. ASCs shall be capable of being operated in an ambient temperature environment of -20°F to +150°F (-28.9°C to 65.6°C).

J. Input-Output Processing:

1. Digital outputs shall be relays, 24VAC or VDC maximum, 3 amp maximum current. Triac outputs are unacceptable. Each output shall have a manual Hand-Off-Auto switch to allow for override and an LED to indicate the operating mode of the output.

2. Universal inputs shall be Thermistor (BAPI Curve II) 10K Ohm at 77EF (25EC), 0-5VDC - 10K Ohm maximum source impedance, 0-20mA - 24 VDC loop power 250 Ohm input impedance, Dry Contact - 0.5mA maximum current.

3. Analog electronic outputs shall be voltage mode 0-10VDC or current mode 4-20mA.

4. Enhanced Zone Sensor Input shall provide one thermistor input, one local setpoint adjustment, one timed local override switch, and an occupancy LED indicator.

2.8 UNITARY CONTROLLER INTERFACE

A. Unitary Controller Interfaces (UCIs) shall be provided where small unitary type controllers are required but these small controllers are not capable of direct connection to the Controller LAN. UCIs shall reside on the Controller LAN.

B. The UCI shall use the BACnet™ communication protocol to communicate with all other Controller LAN controllers and shall, at a minimum, support the following Objects and Application Services (Conformance Class 3):

Objects >	Binary Input	Services >	Read property
	Binary Output		Write property
	Binary Value		I-Am
	Analog Input		I-Have
	Analog Output		Read Multiple Property
	Analog Value		Write Multiple Property
	Calendar		Who-Has
	Schedules		Who-Is

C. The UCI shall use the BACnet™ protocol for communication to the attached UCs over the Sub-Controller LAN. The communication speed between Sub-Controller LAN shall adjustable from between 9600 baud to 115.2 kbps.

D. A serial or USB port shall be provided on the UCI for the interface of the operators' portable computer (future). All network interrogation shall be possible through this port.

E. Each UCI shall execute application programs, calculations, and commands via a 32-bit microcomputer resident in the UCI. All operating parameters for application programs residing in each UCI shall be stored in read/writable nonvolatile flash memory within the controller and shall be able to upload/download to/from the SAN DIEGO BAS server via the Web based GUI with appropriate password level. All nonvolatile memory shall have a battery backup of at least five years.

Firmware revisions to the controller should be able to be made from the SAN DIEGO BAS server via the Web based GUI.

F. The UCI shall contain both software and hardware to perform full DDC PID control loops.

G. UCI Circuits shall be optically isolated.

2.9 ELECTRONIC TEMPERATURE ELEMENT AND TRANSMITTER

A. Zone Space Sensors

1. Each UC or ASC controlling a single zone application shall be provided with a space temperature sensor. The space sensor shall include a thermistor packaged in the standard UC/sensor design, timed override button, set point adjustment, and a maintenance communication port.

B. All Other Temperature Sensors

1. All Temperature sensors connected to a PFC or an ASC shall be a Type II Thermistor compatible with the attached BAS controller without the need for any signal conversion hardware. The accuracy of the thermistor shall be +/- 0.5°F over the range of the sensor. Manufacturer/Model: Precon ST series.

2. Sensors used for mixed air applications shall be 25' averaging type. The sensor span shall have a field set range of 32.0°F to 160.0°F.

3. Duct temperature sensors for supply air temperatures and return temperature shall be a minimum of 18" in length. The sensor span shall have a range of -30.0°F to +160.0°F.

4. Sensors used for outdoor air temperature shall be provided complete with a sunshield. The sensor span shall have a range of -30.0 °F to +140.0 °F.

5. All chilled water sensors and sensors placed in locations susceptible to condensation (outside or in chilled and condenser water liquid lines with the potential to drop below the ambient dew point) shall be furnished complete with a NEMA 3R enclosure for the electronics.

6. All immersion water sensors shall have an immersion length of one half the pipe diameter plus the length of the pipe tap. The sensors shall have a range of +10.0 °F to +230.0 °F. Units shall be furnished complete with a brass thermowell.

2.10 CURRENT TRANSDUCERS

A. Current sensing transducers shall measure the AC current of loads and shall output a 4-20 mA DC signal over the measured range of 0 to 20 amps AC. If the load is in excess of 20 amps AC, a step down current transformer shall be

selected for the actual range of the load and used in conjunction with the current transducer. Manufacturer/Model: Neilsen-Kuljian 4CMA Series.

2.11 CURRENT SENSING SWITCH

A. Current sensing relays shall indicate the presence of AC current. The transistor switches shall be rated for switching controller DC current up to 150 mA continuously at 30 VDC or 500 mA momentarily at 30 VDC. The setpoint of the contact operation shall be field adjustable from 1 to 150 amps AC. The switch shall be self-powering with an applied power indication LED and a second switched load LED for local indication. Manufacturer/Model: Neilsen-Kuljian PD75 Series.

2.12 AIR DIFFERENTIAL PRESSURE SWITCHES

A. Air differential pressure switches shall have an adjustable setpoint of from 0.05" W.C. to 12.0" W.C. Manual reset shall be provided where indicated on the drawings. One snap acting SPDT Type C switch shall be enclosed under a NEMA 1 enclosure with a 1/2" conduit opening. Contacts shall be rated for 10 amps at 120 VAC. Manufacturer/Model: Cleveland AFS series.

2.13 ELECTRIC LINE VOLTAGE THERMOSTAT

A. The thermostat shall be of the bimetallic design with a SPDT set of contacts rated for 120 VAC at 25 amps. Thermostat shall have an adjustable set point of from 50 to 86^0 F with a fixed differential of 2.0^{0}F. The cover shall be metal. Manufacturer/Model: Barber-Coleman Model No. TC-195.

2.14 ELECTRIC FLOW SWITCH

A. The switch shall utilize a multi-segment paddle for use in pipes ranging in size from 1" to 8" with a maximum operating pressure of 150 PSIG and utilize a sealed bronze bellows (packless construction). A snap-acting SPDT switch rated for 16.0 amps at 120 VAC shall be installed in a NEMA 1 enclosure with 1/2" conduit knockout is used for indoor applications. A NEMA 4 enclosure with threaded 1/2" rigid conduit connection is used in all outdoor or high humidity applications, on liquid lines handling fluids below ambient dewpoint or as indicated on the drawings. Manufacturer/Model: Johnson F61 series.

2.15 LIQUID DIFFERENTIAL PRESSURE SWITCH

A. Switch shall have an adjustable set point of from 3 to 30 PSIG and a minimum differential of 2 PSIG. One snap acting SPDT switch enclosed under a NEMA 1 enclosure with 1/2" conduit opening and rated for 12 amps at 120 VAC shall be provided. Manufacturer/Model: Johnson P74 series.

2.16 CONTROL RELAYS

A. Control relay contacts shall be rated for 150% of the loading application, with self-wiping, snap-acting silver cadmium Form C contacts, enclosed in dust proof enclosure. Relays shall be equipped with the necessary mounting base, DIN rail, labels, termination clips, etc. and a coil transient suppression devices. All relays for control by the BAS shall have 24 VAC coils. All other required relays shall have coil voltages appropriate for the installation. Manufacturer/Model: IDEC RH Series.

2.17 CONTROL TRANSFORMERS

A. Control transformers required for all other control purposes including control of pilot duty relays, power supplies, damper and valve actuators, etc. shall be provided. Control transformers 100 VA and less may have internal secondary overload if desired but anything over 100 VA shall be external fused. In no case shall a transformer have a capacity less than 65% of the attached load.

2.18 AUTOMATIC DAMPERS

A. All automatic dampers shall be furnished under this section of the specifications unless provided as part of the equipment.

1. Control Dampers not required for measurement of outside air velocity pressure shall be constructed of galvanized steel with synthetic or Teflon bearings and trunnions of non-corrosive materials. Each blade shall have a positive closing butyl-rubber or neoprene edge seal, and spring loaded side seals unless otherwise noted. Dampers shall be designed so that the blades are interconnected to give parallel movement. Jack shafting shall be provided for all dampers greater than 24" x 48" and damper shaft extensions shall be provided for connection of damper actuators outside the duct.

    a. Parallel Blade Dampers: Provide parallel blade type automatic dampers for return air, two position, the face section of face and bypass dampers, and where indicated on the drawings.

    b. Opposed Blade Dampers: Provide opposed blade type dampers for volume control, exhaust and outside air dampers of a mixing section, throttling application and, where indicated on drawings.

    c. Manufacturer/Model: Ruskin CD-36

2.19 DAMPER ACTUATORS

A. Modulating and Two-Position Damper Actuators

1. The actuator shall be of the direct-coupled design. The fastening clamp assembly shall be of a "V" bolt design with associated "V" shaped toothed cradle attaching to the shaft for maximum strength and eliminating slippage. Spring return actuators shall have a "V" clamp assembly of sufficient size to

be directly mounted to an integral jackshaft of up to 1.05 inches when the damper is constructed in this manner. Actuators shall be designed for a minimum of 60,000 full stroke cycles at the actuator's rated torque and shall have a two (2) year manufacturer's warranty, starting from the date of installation.

2. The actuator shall have electronic overload or digital rotation sensing circuitry to prevent damage to the actuator throughout the entire rotation of the actuator. Mechanical end switches or magnetic clutch to deactivate the actuator at the end of rotation are not acceptable. For power-failure/safety applications, an internal mechanical spring return mechanism shall be built into the actuator housing. Non-mechanical forms of fail-safe operation are not acceptable.

3. Spring return actuators shall be provided for all outside and exhaust/relief air dampers in addition to all locations indicated on the drawings. Spring return actuators shall be capable of both clockwise or counterclockwise spring return operation by simply changing the mounting orientation

4. Proportional actuators shall accept Pulse Width Modulation (PWM) control signaling and power from a 24 VAC source, 4-20 mA, or Tri-State control. Two position actuators shall be 24 VAC with spring return.

5. All actuators shall not require more than 10 VA regardless of the operating voltage.

6. Actuators shall be provided with a conduit fitting and a minimum three-foot electrical cable and shall be pre-wired to eliminate the necessity of opening the actuator housing to make electrical connections.

7. Manufacturer: Belimo

2.20 CONTROL VALVES

A. Ball Control Valves

1. Valves to be two-way industrial quality with bronze bodies and female NPT threads or flange connections. Valve bodies may also be stainless steel, titanium or nickel with operating pressure up to 2000 psi.

2. All valves shall have blowout-proof stem, glass-reinforced Teflon thrust seal washer and stuffing box ring with minimum 600 psi rating. Stem packing gland screw shall be adjustable for wear.

3. Standard chromium plated stainless steel ball and stem, shall be rated at a minimum of 600 psi WOG (water-oil-gas), cold, non-shock, and 150 psi for saturated steam service. All valves shall be provided with Reinforced Teflon seats.

4. Valve actuators shall be factory mounted and provided as described in "Valve Actuators."

5. Manufacturer: Delta

B. Two- and Three-Way Globe Control Valves Two Inches and Less

1. Valves 1/2 inch through 2 inches shall be bronze, screw type, and shall be rated at 250-psi maximum working pressure for water and steam.

2. Valve stems shall be stainless steel, highly polished, corrosion-resistant, alloy to decrease friction and increase response. Valve plugs shall be brass and guided to insure perfect seating.

3. Stem packing shall be spring loaded EP V-Rings for water applications and Teflon V-Rings for steam applications to eliminate leakage around the stem and insure a minimum amount of stem friction. Stem lift shall be 1/2 inch to 3/4 inch.

4. Flow type shall be equal percentage for water. The maximum operating differential shall be 10 psi for water.

5. Manufacturer/Model: Johnson Controls VA-8000 series

C. Two- and Three-Way Globe Control Valves Greater than Two Inches

1. Valves 2-1/2 inches through 6 inches shall be cast iron flanged, and rated at 125-psi maximum working pressure. The maximum working temperature shall be 300°F/149°C.

2. Valve plug stems shall be stainless steel, highly polished, corrosion-resistant, alloy to decrease friction and increase response. Valve plugs shall be brass and guided to insure perfect seating. Stem packing shall be Teflon, spring loaded EP V-rings to eliminate water leakage around the stem and insure a minimum amount of stem friction. Lift shall be 3/4 inch to 1-1/2 inch.

3. Flow type shall be equal percentage. The maximum recommended differential shall be 10 psi. Composition discs shall be replaceable and provide tight shutoff.

D. Control Two- and Three-Way Butterfly Valves

1. All butterfly valves shall be supplied in accordance with the requirements of this and other applicable Sections.

2. Three way butterfly control valves shall be supplied complete with flanged pipe tees and all linkage necessary to cross-link the two valves.

2.21 CONTROL VALVE ACTUATORS

A. Electronic Valve Actuators

1. All ball and globe valves actuator shall be fully modulating using a 4-20 mA input signal. There shall be a visual valve position indicator. Control power shall be 24 VAC and shall not exceed 8 watts at 24 VAC. The actuator shall provide minimum torque required for proper valve close-off, with an approximate running time of 2 minutes for full rotation. The actuator shall be designed with current limiting motor protection. (End of travel switches and magnetic clutches are not acceptable.) A release button on the actuator shall be provided to allow for manual override, except when utilizing spring return actuators.

2. The actuators and valves shall be factory mounted and tested and supplied.

3. Manufacturers:

   a. Ball valves: Delta

   b. Globe two-way and three-way control valves: Belimo

B. Butterfly Valve Actuators

1. Electronic actuators and linkages shall be factory mounted with each butterfly valve as shown on the control drawings.

2. Modulating valves shall be complete with positioners to modulate the valve with a 4-20 mA input signal. All automatic valves shall have provision shall be made for hand activation of the valve in the event of an actuator failure. Valve actuator shall be powered from 120 VAC. Actuators shall be selected so as to provide positive shut off based on the system operating parameters.

3. Actuators and positioning relays shall be NEMA 4 rated for installation in wet locations. Sun shields shall also be provided for all actuators and positioners installed in locations exposed to direct sunlight.

4. Actuators shall be factory mounted, tested, and supplied.

5. Manufacturer/Model: Keystone Model 777

   a. Two-Position Butterfly Valve Actuators

      i. Outside the scope of this Section.

2.22 INPUT/OUTPUT AND INTERLOCK WIRING

A. Class I circuits

1. All materials required for installation of Class I circuits or circuits operating at greater than 48 VAC or VDC shall meet the requirements stated in Division

16, National Electric Code, and all applicable building codes as they apply to Class I circuits.

B. Class II circuits

1. All materials required for installation of Class II circuits shall meet all requirements of the National Electric Code and all applicable building codes as they apply to Class II circuits.

2. Cable run exposed in plenums where permitted shall contain twisted conductors or pairs of twisted conductors no smaller than 18 gauge. The number of conductors shall be as required by the application and an overall foil shield with stranded drain wire shall be provided in all cases. The cable shall be factory stamped with a clear indication of the cable classification. The cable jacket shall be Teflon or other approved materials that comply with the smoke generation limitations outlined in Article 725 of the NEC, U.L, and all requirements of the NFPA.

3. Cable run in a metallic raceway shall contain twisted conductors or pairs of twisted conductors no smaller than 18 gauge. The number of conductors shall be as required by the application and an overall foil shield with stranded drain wire shall be provided in all cases. The cable shall be factory stamped with a clear indication of the cable classification and number of pairs. The cable jacket shall be PVC. Metallic raceway shall be as specified in Division 16.

2.23 REFRIGERANT VAPOR DETECTOR

A. Provided in accordance with the applicable codes.

2.24 INDOOR AIR QUALITY SENSOR

A. The IAQ sensor shall be specifically designed to generate a linear 0-10 VDC signal proportional to a 0.0 to 100% air quality unit where 0.0% is very poor, 100% is very good, and 50% is average. The components making up the air quality measurement shall include CO2, CO, hydrocarbons, methane, formaldehyde, etc. Mount the sensor directly on a duct and power with a 24 VAC power source. Manufacturer/Model: Staefa FKA-Q1A.

2.25 DUCT VELOCITY STATION

A. Install per manufacturer's instructions to insure proper duct diameters upstream and downstream of flow measuring station. Provide at each location indicated, traverse probes capable of continuous monitoring of total and static pressure pick-up points, along the exterior surface of the cylindrical probe, each internally connected to their respective averaging manifold. Multiple probes, required for specified accuracy, shall be externally connected in a parallel configuration. Each probe shall be extruded aluminum construction with installation hardware specifically designed for duct mounting. The probes shall produce a non-

pulsating signal with an accuracy of 99% of total system flow. Manufacturer/Model: Air Monitor Model VOLU-Probe/1.

2.26 ELECTRONIC DIFFERENTIAL PRESSURE TRANSMITTER

A. Electronic differential pressure transmitter shall be designed to measure the differential air pressure as indicated on the drawings or as required. Pneumatic connections shall be 1/4" barbed and the enclosure shall be provided with holes for panel or field mounting. The output shall be a two-wire 4-20 mA loop-powered device with an input range as indicated in the drawings but not more than twice the actual measure variable. The accuracy, including linearity, hysteresis, and repeatability, shall be less than ±2%. Manufacturer/Model: Modus Series T30.

2.27 ELECTRONIC AIR FLOW ELEMENT AND TRANSMITTER

A. Probes shall be supplied complete with curved duct mounting plate and gasket and the probe shall be constructed of stainless steel. The associated transmitter shall process the flow signal, automatically amplify, and linearize the thermal sensor signal. The indicating transmitter units shall be remote panel mounted and shall have a 3.5 digit, 0.5 " high LCD display and that is calibrated to display flow rate in SCFM. The unit power is 24 VAC, 3-watt power input and the output is 4-20 mA signal linear to the measured airflow rate. The unit selected has a maximum flow rate. Manufacturer/Model: Air Monitor Electra/1 Model C/D.

2.28 ELECTRONIC LIQUID FLOWMETER

A. The flowmeter shall be of the paddle wheel insertion type allowing complete bi-directional flow that penetrates into the line. The flowmeter shall be furnished complete with a flow transmitter that supplies a 4-20 mA or 0-10 VDC signal for each direction as well as a directional signal. Meter shall have an accuracy of no less then 2% of the actual reading over the range of the meter. Meter shall include all necessary equipment to allow the flow meter to be inserted or removed without draining the system. Manufacturer: Onicon

2.29 SMOKE AND FIRE DETECTORS

A. Smoke detectors installation is outside the scope of this section; see Section 13851.

2.30 CONTROL PANELS

A. All indoor control cabinets shall be fully enclosed NEMA 1 Type construction with hinged door, key-lock latch, removable sub-panels. A single key shall be common to all field panels and sub-panels.

B. Provide on/off power switch with over-current protection for control power sources an include a service outlet for main panels where a lap-top is required for controller configuration.

C. The design and workmanship shall comply with the requirements of underwriters laboratories (UL) Bulletin 508 by affixing a UL 508 compliance label to the interior of each panel.

D. Conform to applicable UBC for flame/fuel/smoke rating and ventilation requirements for application of finishes.

E. All individual panel components shall be UL listed.

F. Panels shall have no exposed terminals that may be inadvertently touched (i.e., terminal screws shall be in wells). A plastic protective guard shall be provided for all exposed terminals greater than 50 VAC or 50 VDC.

2.31 ELECTRICAL POWER AND SIGNAL WIRING

A. Control and signal wiring external to the control panels and all power wiring shall conform to the requirements of Division 16 specifications and the equipment manufactures recommendations for the equipment it is connected to.

B. Power to the BAS shall be provided from dedicated circuits. Providing power to any BAS components from lighting circuits, receptacle circuits or any other circuit that serves other building general loads is unacceptable. Providing power from primary BAS control panels to controllers and sub-controllers is acceptable.

C. Control and signal wiring in control panels shall be restrained by plastic ties or ducts. Hinge wiring shall be secured at each end so that any bending or twisting will be around the longitudinal axis of the wire and the bend area shall be protected with a sleeve.

D. Arrange wiring neatly, cut to proper length, and remove surplus wire. Provide abrasion protection for any wire bundles which pass through holes or across edges of sheet metal.

E. Use manufacturer's recommended tool with the proper sized anvil, for all crimp terminations. No more than one wire may be terminated in a single crimp lug and no more than two lugs may be installed on a single screw terminal.

F. Wiring shall not be spliced or tapped except at device terminals or terminal blocks.

G. Provide wire markers per Division 16 specifications on each conductor in the panel, at load connections, and at intermediate terminal blocks. Identify circuit with control wire number, as per Drawings.

H. The Subcontractor will be responsible for providing, installing, labeling, terminating, control and control power wiring as well as the BAS communications system (Ethernet) wiring.

I. Connection of field wiring shall be made on the terminal blocks in the PLC control panels.

PART 3 EXECUTION

3.1 GENERAL

A. All field hardware, control devices, conduit, wiring, etc. shall be provided as specified in PART 2.

1. The installation of all aspects of the system shall comply with all applicable codes, regulations, and all related Subcontract Documents.

2. The installation of all materials shall be in accordance with the published manufacturer's recommendations without exception. If for some reason a particular component cannot be installed in compliance with these recommendations, the Subcontractor shall advise The City of San Diego of the situation.

3. Where miscellaneous materials are required to complete an installation, e.g. isolation valves for pressure switches, wall switches for an exhaust fan control circuit, etc., the materials shall be supplied as defined in the relevant section of these specifications and installed under this section of the specification, unless otherwise noted.

4. Coordinate with other trades where installation of a particular component requires other trades to be involved. Installation coordination includes location the correct placement of thermowells, flow switches, dampers, control valves, control power circuits, etc. Care shall be exercised to identify locations that meet the requirements of the manufacture including upstream and downstream distances, pressures, temperatures, etc.

5. All signal wiring requiring shielding shall have the shield terminated at the controller end only. The shield wire shall be trimmed and insulated at the device end.

6. Label all wiring with permanent labels indicating the point device identifier. Install a phenolic label mounted at the device indicating the device type and point identifier name.

7. All field devices shall be labeled with 1" x 3" phenolic labels. Labels shall include the point name and device name. Labels for BAS controllers shall indicate the breaker and panel number of the power source. Labels shall be

glued, attached with screws, or stainless wire in the case of valves and actuators.

B. All software development shall be completed by BAS programmers that have been factory trained in programming and graphic development techniques of the BAS. This includes development of the existing campus BAS operators' software, if it differs from the manufacturer of BAS equipment supplied on this project. All software developed shall be programmed to integrate seamlessly with the existing network of similar installations of this same BAS at San Diego which reside on one of the existing San Diego BAS servers. In other words, new buildings shall be hung on existing trees.

3.2 NETWORKING/COMMUNICATION

A. General

1. All LAN's shall be installed in a manner recommended by the manufacturer, based on the environment, communications speed requirements, and distance. All LAN media shall be installed in a manner that provides protection from physical damage and interference from RF or other electrical sources.

B. Primary Local Area Network (LAN)

1. The Primary LAN is existing; however, all media required to connect new Gateway Controllers to the Primary LAN shall be installed with materials and procedures that comply with the requirements of the facility communications personnel and the BAS equipment manufacturer. The necessary IP addresses for the GWC's shall be assigned by The City of San Diego.

C. Controller Local Area Network (LAN)

1. The Controller LAN shall be installed with materials and procedures that comply with the requirements of the BAS equipment manufacturer. In general, the conductors are to be a 22 gauge, low capacitance, twisted-pair.

D. Sub-Controller Local Area Network (LAN)

1. The Sub-Controller LAN shall be installed with materials and procedures that comply with the requirements of the BAS equipment manufacturer. In general, the conductors are to be a 22 gauge, low capacitance, twisted-pair.

3.3 BACNET™ COMPATIBILITY

A. All BAS software shall be developed to meet the BACnet™ conformance class of the relevant LAN. Refer to Part 2 of this section.

3.4 BAS SERVERS

A. All new SAN DIEGO BAS servers shall be located in a lockable server room supplied by a UPS for backup power. The Subcontractor shall coordinate with ES-DE to utilize existing BAS servers whenever possible. Access shall be in coordination with the BAS administrator, usually ES-DE. BAS operating software and all support software shall be installed and configured on the appropriate server. All of the software development specified in this section shall be implemented on all new or existing servers as appropriate for this project.

B. User Access

1. Complete installation of STR supplied operator names derived from the approved submittal request form. During the training session, complete the input of login and passwords associated with those personnel.

C. Reports and Trends

1. All associated I/O data as well as computational data shall be linked to the appropriate formatted report for automatic archiving on the San Diego BAS server.

2. Provide report capability for monitoring of each system. Custom reports and trends shall be easily configured by the operator for either printing or archiving. The operator shall be able to easily adjust the scale of the trend graphs and trend at least 3 separate points of the same type (analog with analog, binary with binary) on the same graph as he/she chooses. The trend graphics shall have a dynamic cursor option for identifying values of individual points on the trend graph.

D. Dynamic Color Graphic Displays

1. The slides shall include a color graphic representation of the geographic area or system being observed, all realtime point value data, user interactive setpoints, schedules, etc., and realtime alarm information. Graphics shall provide flexible "pick" options, such as expandable trees, to easily move across the system without the need to go back to the trees start. The focus on the graphic generation shall be ease of understanding and user interaction for all day-to-day functions. At a minimum, the following graphic slides shall be developed:

   a. A graphic shall be provided for each floor and/or quadrant (depending on the size of the building) of each building. All major walls, temperature zones and actual space numbering shall be indicated. These drawings may be scanned from building floor plans or imported from ACAD drawing files and modified as necessary. All zone temperature shall either be displayed within the appropriate zone in text format or the area of each zone shall be color coded to represent the relationship to set point. Each graphic shall indicate the current occupied/unoccupied status of the "building" floor or quadrant group" or "floor subgroup" schedules, the

minimum and maximum zone temperature on the floor, the run status of all air handling equipment serving the floor, all un-acknowledged alarms, etc. "Pick" windows shall be provided on these graphics to permit the operator to view a specific building air handling unit graphic or a graphic of the fan coil unit or outside air handling unit supplying a particular area. "Picks" shall be provided to move back to the building or the campus.

b. A graphic shall be provided for each temperature zone of each floor. This graphic shall be a graphic representation of the mechanical equipment serving the zone. All real time system information relative to any particular temperature zone and all color-coding of the temperature zone shall be the same as was provided for the floor plan graphics. This graphic shall indicate the current occupancy status and which schedule group has control of the zone. "Pick" windows shall be provided on these graphics to permit the operator to view the specific supporting mechanical system relative to the respective floor plan or to move back to the building floor plan.

c. Separate graphics shall be provided for all mechanical equipment serving the respective building or zone. This includes all air-handling units, central chilled water plant, heating plant, etc. Mechanical system graphics shall be displayed complete with all real time data relevant to the equipment being displayed including temperatures, flow rates, positions, etc. Every controlled or monitored device (all dampers, valves, filter banks with differential pressure, etc) related to the major unit being described on the graphic, shall be shown and labeled on the same graphic. The intent is to show the entire "chilled water system" or "building heating water system," for instance, as a coherent unit with all the necessary information on a single page.

d. All valves or dampers, whether normally open or normally closed, shall be described as 0% when fully closed and 100% when fully opened as seen on the Web based GUI. Three-way control valves shall have a descriptive label on the GUI that clearly indicates the direction of flow when fully opened or closed.

e. A real-time graphic of the BAS system architecture shall be provided. The graphic shall indicate the actual wiring configuration of all Controllers on the network. Real-time information regarding the communication status of all BAS controllers shall be displayed on this graphic. Additionally, any controller that has an alarm condition shall be clearly identified on this graphic. If the size of the network prevents display of the entire network on one page, multiple graphic slides with connectors and "picks" may be employed.

E. Database Save/Restore/Back-Up

1. All new or existing San Diego BAS servers shall have an ongoing backup scheme configured and activated with cooperation from IT support (e.g., IST-12) so that all BAS related software and databases are backed up on a schedule. After all BAS Controller software and Graphic slides have been

developed, two complete backup sets of this software shall be stored on CD and delivered to the STR for archiving. All future warranty work, software patches, upgrades or punch list resolution relating to BAS software or graphics shall be done on the appropriate San Diego BAS server in coordination with the BAS administrator. In the event of server failure, a verified method of restoring the BAS onto the server from backup shall be included in the BAS administrator training with the controls subtier-subcontractor.

F. Alarm Paging

1. Major alarms shall initiate paging and email notification to designated SAN DIEGO pagers and email utilizing the San Diego email/paging system.

3.5 GATEWAY CONTROLLERS

A. New GWCs shall be installed where required to create a new building Controller LAN.

1. All new GWCs shall be installed in accordance with manufacturer's instructions. 120 VAC Power shall be provided to each GWC. If a GWC requires power at a different voltage or at a location other than as shown on the drawings, it shall be the work of this section to provide and install all necessary conduit, wiring, transformers, etc. and make the final connections. All power shall be verified as work of this section prior to powering the controllers.

2. All BAS Controllers shall be installed in a factory enclosure that provides protection from the environment and is adequately ventilated to protect against excessive temperature exposure.

B. Communications

1. It shall be the work of this section to connect all GWCs to the Primary LAN. It shall also be the work of this section to develop the Controller LAN. This work includes installation and troubleshooting of new media.

3.6 PRIMARY BAS CONTROLLERS

A. General

1. New PFCs shall be installed where required or indicated on the drawings; however, in no case shall more than 90% of the maximum attached potential node limitations be designed nor shall more than 75% of the PFC RAM be utilized by the programming code specified herein, including trending and global programming. If these limits are met, additional PFCs or RAM shall be added.

2. All PFCs shall be installed in accordance with manufacturer's instructions, and 120 VAC power shall be provided to each. If a PFC requires power at a different voltage or at a location other than as shown on the drawings, it shall be the work of this section to provide and install all necessary conduit, wiring, transformers, etc. and make the final connections. All power shall be verified as work of this section prior to powering the controllers.

3. All PFCs shall be installed in a factory enclosure that provides protection from the environment and is adequately ventilated to protect against excessive temperature exposure.

B. Communications

1. It shall be the work of this section to develop Controller LAN. This work includes installation and troubleshooting of new media. All PFCs shall be connected to the Controller LAN network in a manner recommended by the manufacturer based on the environment, communications speed requirements, and distance.

C. Input/Output

1. The installation of all BAS field control components and the associated I/O wiring back to the respective BAS Controller shall be installed under this section of the specification. Each point shall be checked by the subcontractor for voltage, short circuit, etc. prior to termination to the PFC to prevent potential damage to the controller.

D. Software Requirements

1. All sequences of operation as stated in the Subcontract Documents are to be implemented. In addition to these specific sequences, the following general requirements shall be implemented for a complete operating software package.

   a. SOO Features: The following features shall be provided as a minimum:
      - Unoccupied operations
      - Optimal start
      - Supply air reset based on zone load
      - Boiler operation based on zone demand
      - Chiller operation based on zone demand
      - Heating and chilled water temperature reset based on zone demand

   b. Run Time Totalization: All digital input, digital output points, and digital software points (triggers or flags) shall be setup to accumulate totalized run time information. The frequency of accumulation and reset shall be based on report and trending requirements.

3.7 APPLICATION SPECIFIC CONTROLLERS (ASC)

A. The same execution requirements specified for the Primary BAS Controllers shall apply to the Application Specific Controllers.

3.8 UNITARY CONTROLLER INTERFACE (UCI)

A. General

1. New UCIs shall be installed where required or indicated on the drawings; however, in no case shall more than 90% of the maximum attached UC node limitations be designed.

2. All UCIs shall be installed in accordance with manufacturer's instructions. 120 VAC power shall be provided to each UCI. If a UCI requires power at a different voltage or at a location other than as shown on the drawings, it shall be the work of this section to provide and install all necessary conduit, wiring, transformers, etc. and make the final connections. All power shall be verified as work of this section prior to powering the controllers.

3. All UCIs shall be installed in a factory enclosure that provides protection from the environment and is adequately ventilated to protect against excessive temperature exposure.

B. Communications

1. It shall be the work of this section to develop Controller LAN for connection of each UCI. This work includes installation and troubleshooting of new media. All UCIs shall be connected to the Controller LAN in a manner recommended by the manufacturer based on the environment, communications speed requirements, and distance.

C. Alarms

1. The same analog input points described in the Primary BAS Controllers section above shall be used for all UCs connected to the Sub-Controller LAN, with upper and lower limits established and alarms generated in the event these limits are exceeded. The Subcontractor shall submit specific limit details for every point; however, these limits are generally defined as described in the ALARM PARAMETER TABLE for the Primary BAS Controllers section above.

   a. Digital inputs associated with all attached UCs shall be compared to the associated digital outputs (e.g., fan start/stop vs. fan status) and alarms shall be issued if the commanded position is inconsistent with the actual condition, after a start delay timer of 30 seconds.

   b. All alarms shall be directed viewable via the Web based GUI, and archived on the hard drive as routed by the users. The identity of the

operator acknowledging the alarm shall be archived with the alarm message text.

3.9 UNITARY CONTROLLER (UC)

A. General

1. A new UC shall be installed for each fan coil unit, VAV unit, unit ventilator, etc. The UC shall mount directly on the equipment unit or nearby. UCs shall be installed such that reasonable access to the unit can be achieved. The installation shall not interfere with access to other components.

2. All UCs shall be installed in accordance with manufacturer's instructions. 120 VAC Power shall be provided at various locations as indicated on the drawings. If a controller requires power at a different voltage or a location other than as shown on the drawings, it shall be the work of this section to provide and install all necessary conduit, wiring, transformers, etc. and make the final connections. All power shall be verified as work of this section prior to powering the controllers.

3. All UCs shall be installed in a factory enclosure that provides protection from the environment and is adequately ventilated to protect against excessive temperature exposure.

B. Communications

1. It shall be work of this section to install the Sub-Controller LAN from each UCI. This work includes installation and troubleshooting of any new or existing media. All UCs shall be connected to the BAS Sub-Controller LAN in a manner recommended by the manufacturer based on the environment, communications speed requirements, and distance.

C. Input/Output

1. The installation of all BAS field control components and the associated I/O wiring back to the respective UC shall be installed under this section. Each point shall be checked by the Subcontractor for voltage, short circuit, etc. prior to termination to the BAS Controller to prevent potential damage to the controller

3.10 ELECTRONIC TEMPERATURE ELEMENT AND TRANSMITTER

A. All temperature sensors shall be installed and wired under this section of the specification.

1. Immersion temperature sensors shall be installed in the thermowells provided with the sensor. A thermo-conductive paste shall be applied between the sensing element and the thermowell.

2. Outdoor air temperature elements shall be installed in a location that is continuously shaded and not effected by heat generating equipment or equipment intakes or discharges. The element shall be installed under a sun shield and high enough to avoid damage from vandalism.

3. Duct point temperature elements shall be installed directly on ductwork and the connection between the duct and the flange shall be gasketed and secured with sheet metal screws to prevent any air leakage. Care shall be taken to avoid direct contact between the temperature element and any heat transfer surface such as a coil.

4. Duct averaging elements shall be installed with the same requirements as for the temperature point element; however, the averaging element shall be extended across the entire duct area in a zig-zag pattern. Special clips shall be used to secure the element at turns to prevent chafing of the element. Where the element passes through the duct, plastic tubing or similar protection shall be installed on the element to prevent damage to the element from vibration.

5. Space temperature transmitters shall be installed 60" above finished floor. If a setpoint adjustment is provided on the sensor then the unit shall be installed 48" above finished floor (A.F.F.) unless otherwise specified on the plans. Location of space temperature sensors shall be coordinated with furniture layout drawings to avoid dead air space behind bookshelves or discharge heat from equipment (such as printers, copiers, coffee pots, etc.).

6. Space temperature sensors shall be mounted in server and telecommunications rooms for monitoring and alarm in case of CRAC (computer room air conditioner) failure. Temperature sensors shall also be provided in the mechanical equipment rooms for monitoring and alarm. These alarms shall be sent to duty pagers via the BAS.

3.11 CURRENT TRANSDUCERS

A. Current transducers shall be installed on one hot leg of either single or three phase and after the local disconnect. The transducer shall be securely mounted in the associated motor starter housing or motor control.

3.12 CURRENT SENSING SWITCH

A. Current switches shall be installed in one leg of three phase circuits and the hot leg of single phase circuits and in all cases, after the local disconnect. The switch shall be securely mounted in the associated motor starter housing or motor control. The switches shall be adjusted to close at approximately 10% of the attached load's full load amps.

3.13 ELECTRIC LINE VOLTAGE THERMOSTAT

A. Where thermostats are to be mounted remotely from the controlled device, all Class I and/or Class II conductors shall be installed in a metallic raceway and the thermostat shall be mounted on a junction box. Mount the thermostat 48" A.F.F unless otherwise specified on the plans.

3.14 ELECTRIC FLOW SWITCH

A. Flow switches in liquid lines shall be installed in a Thread-O-Let with isolation valve or valves to allow removal without draining the system. The paddle of the flow switch shall be selected and the spring adjustment shall be carefully set to provide good switching between flow and no flow conditions. Ensure that the flow direction of the device matches the actual flow direction.

3.15 LIQUID DIFFERENTIAL PRESSURE SWITCH

A. Differential pressure switches shall be connected to pressure taps installed on the piping under other sections of the specification. The connections shall be 1/4" hard copper complete with isolation valves on both lines. The switch shall be supported either by mounting on a wall or on a frame constructed from Unistrut. The switch setpoint and differential shall be set as necessary to provide good switching between pressure and no pressure conditions.

3.16 CONTROL RELAYS

A. Control relays shall be mounted in the respective termination panel and are intended primarily to isolate the BAS controller digital outputs from the source load. If a relay must be field mounted, it shall be installed in a NEMA I housing.

B. Control relays shall be installed in bases and the based mounted on a DIN rail. All accessories including end clips, jumpers, etc. shall be provided. All wiring shall be labeled. Multiple conductors shall be bundled and run by Class in plastic wireways. Relays shall be labeled as indicated in the shop drawings for ease in troubleshooting.

C. Relays coils shall be wired complete with 24 VAC power such that a jumper (simulating a BAS contact closure) will energize the control relay.

3.17 CONTROL TRANSFORMERS

A. Control transformers shall be field mounted using a plate to mount on an electrical junction box. Locations shall be as identified on the shop drawings or as determined by field requirements.

B. A phenolic label on each transformer shall identify the power source by breaker panel and circuit. Fusing of the primary and secondary sides and sizing shall be as required by the NEC.

3.18 CONTROL VALVES

A. The valves will be installed by the mechanical Subtier-subcontractor and are outside the scope of this section.

3.19 CONTROL VALVE ACTUATORS

A. Electronic Valve Actuators

1. Valve actuators shall be mounted in either the vertical (above the pipe) or 90 degrees from vertical position. Steam valve actuators shall be mounted at 90 degrees from vertical to avoid heat damage to actuator. Actuators shall be installed to ensure they do not interfere with the operation or access to other equipment such as balancing valves. Actuators shall be configured in a consistent manner with attention to actuator rotation direction so that a 0% "close" or 100% "open" command has consistent results to close or open the valve. All valves serving coils exposed to outside air and possible freezing conditions shall be tested and documented to proper rotational direction.

3.20 INPUT/OUTPUT AND INTERLOCK WIRING

A. General

1. All wiring located in mechanical spaces, chiller or boiler plants, outdoors, in exposed areas, or in areas of potential damage, regardless of class, shall be run to a metallic raceway of the appropriate design for the application. Refer to Division 16.

2. All Class I and Class II conductors shall be selected and installed in complete compliance with the NEC, regardless of the definition of conductor types stated for each device type. The conductor types stated for each device type installation are provided to indicate the design intent only.

B. Class I Wiring

1. All wiring shall be installed in accordance with the NEC and Division 16. Class I and Class II wiring shall be separated as defined in Art. 725 of the NEC. All Class I circuits and all control or power circuits greater than 48 VAC or VDC shall be run in a metallic raceway. Conduit shall be run parallel with building lines in a neat professional manner and supported as defined in Division 16.

C. Class II Wiring

1. All wiring shall be installed in accordance with the NEC and Division 16. Class II wiring run in hollow walls and in accessible concealed areas may be run without conduit, as local codes permit. Cables run loose shall be tied to building structures no less than every 6 feet and bundled where possible. Care shall be taken to avoid chafing at points of connection to the building.

Cables run in conduit shall be installed in the same manner required for Class I conduit runs.

3.21 INDOOR AIR QUALITY SENSOR

A. The IAQ sensor shall be mounted on the ductwork and in rooms where indicated on the system description. Exercise caution during installation to prevent contamination of the sensor element.

3.22 EQUIPMENT CONNECTIONS

A. BAS Class II field wiring for all non-control device applications shall be installed under this section of the specification. This includes equipment such as VFDs, chillers, boilers, etc. that may have point types include status or alarm monitored from an equipment supplier Class "C" contact or analog control signals to equipment, etc.

3.23 ELECTRONIC DIFFERENTIAL PRESSURE TRANSMITTER

A. All differential pressure transmitters shall be installed within 10 feet of the pressure sensing point. The transmitters shall be installed in a NEMA I housing for interior conditioned spaces and in a NEMA 3R housings for outside or unconditioned spaces. The transmitters and housings shall be rigidly supported to prevent vibration and shall never be mounted to ductwork or piping. Access to the transmitter shall be provided.

3.24 ELECTRONIC LIQUID FLOWMETER

A. The flow meter/ transmitter shall be installed according to the manufacturer's recommendations with isolation valve or valves to allow removal without draining the system and tied into the DDC system.

3.25 SMOKE AND FIRE DETECTORS

A. Installation of smoke detectors and the associated wiring are outside the scope of this Section (ref Section 13851, Addressable Fire Alarm System); however, under this section, provide an interlock for HVAC shutdown from the fire detection system.

END OF SECTION

SECTION 15990
TESTING, ADJUSTING, AND BALANCING

PART 1 GENERAL

1.01 SCOPE

This section covers the cleaning, testing, adjusting, and balancing of the air system(s) associated with the heating, ventilating, and air conditioning (HVAC).

1.02 GENERAL

Equipment and systems shall be cleaned, tested, adjusted, and balanced in full conformity with the drawings, specifications, engineering data, instructions, and recommendations of the equipment manufacturer unless exceptions are noted by Resident Engineer.

A. Coordination

1. Contractor shall verify that all components and devices necessary for a properly functioning system have been provided. Prior to cleaning, testing, adjusting, and balancing, Contractor shall verify that each system has been installed properly and is operating as specified. Equipment bearings shall be lubricated in accordance with the manufacturer's recommendations.

2. Air systems shall be complete and operating, with dampers, filters, ductwork, air outlet and inlet devices, duct mounted equipment, and control components.

B. Governing Standards

1. Except as modified or supplemented herein, all work covered by this section shall be performed in accordance with all applicable municipal codes and ordinances, laws, and regulations. In case of a conflict between this section and any state law or local ordinance, the latter shall govern.

2. All work shall comply with the latest edition of AABC, NEBB, or SMACNA standard manuals for testing, adjusting, and balancing of air systems.

1.03 SUBMITTALS.

A. Drawings and Data

1. Complete apparatus report sheets for all air systems shall be accurately and completely filled out in accordance with the Standard's manual. Copies of the final test readings and report sheets shall be submitted in accordance with Specification Section 01300, "Submittals". A description of the standard procedures used during testing, adjusting, and balancing shall be included in the submittal. The submittal shall include a reduced set of drawings, with the air outlet devices, air inlet devices, and equipment identified to correspond with the report sheets.

2. The apparatus report sheets shall include the following information:

a) Title Page:

i) Company name

ii) Company address

iii) Company telephone number

iv) Project name

v) Project location

vi) Project Engineer

vii) Project Contractor

viii) Project altitude

ix) Date

b) Instrument List:

i) Instrument

ii) Manufacturer

iii) Model

iv) Serial number

v) Range

vi) Calibration date

c) Air Moving Equipment:

i) Unit number

ii) Location

iii) Manufacturer

iv) Model and serial number

v) Airflow, design and actual

vi) Total static pressure (total external), design and actual

vii) Static pressure, inlet and discharge

viii) Total pressure

ix) Fan RPM, design and actual

d) Electric Motors:

i) Manufacturer

ii) Motor type and frame

iii) HP/BHP

iv) Phase, voltage, amperage, nameplate, actual, no load.

v) RPM

vi) Service factor

vii) Starter size, rating, heater elements

e) V-Belt Drive:

i) Required driven RPM

f) Return Air/Outside Air Data:

i) Unit number

ii) System airflow, design and actual

iii) Return airflow, design and actual

iv) Outside airflow, design and actual

v) Return air temperature

vi) Outside air temperature

vii) Mixed air temperature, design and actual

viii) Outside/return air ratio, design and actual

g) Coil Data:

i) Unit number

ii) Location

iii) Service

iv) Manufacturer

v) Fin spacing and rows

vi) Face area

vii) Airflow, design and actual

viii) Air velocity, design and actual

ix) Entering air DB temperature, design and actual

x) Entering air WB temperature, design and actual

xi) Leaving air DB temperature, design and actual

xii) Leaving air WB temperature, design and actual

xiii) Air pressure drop, design and actual

h) Duct Traverse:

i) System zone/branch

ii) Duct size

iii) Area

iv) Velocity, design and actual

v) Airflow, design and actual

vi) Duct static pressure

vii) Air temperature

viii) Air correction factor

i) Outlet and Inlet Devices:

i) Air outlet and inlet device number

ii) Room number/location

iii) Air outlet and inlet device type

iv) Air outlet and inlet device size

v) Area factor

vi) Velocity, design, preliminary, and final

vii) Air flow, design, preliminary, and final

viii) Percent of design airflow

j) Sound Level Report:

i) Location

ii) Octave bands - equipment off

iii) Octave bands - equipment on

k) Package Air Conditioning Unit.

i) Unit number

ii) Location

iii) Manufacturer and model

iv) Refrigerant type and capacity

v) Airflow, design and actual

vi) Return airflow, design and actual

vii) Outside airflow, design and actual

viii) Dry bulb temperature, entering and leaving

ix) Wet bulb temperature, entering and leaving

x) Outside air temperature, dry and wet bulb

1.04 QUALITY ASSURANCE

A. Contractor shall provide the services of a licensed independent contractor, certified by AABC or NEBB and with proven experience on at least three similar projects, to perform operational testing, adjusting, and balancing of the air systems. The total system balance shall be performed in accordance with AABC, SMACNA, or NEBB Procedural Standards for the work.

PART 2 MATERIALS

2.01 SERVICE CONDITIONS

A. All equipment shall be adjusted or balanced to meet the specified conditions and to operate at the elevation indicated in the equipment sections.

2.02 CONSTRUCTION.

A. Painting

1. Surface finish damaged during cleaning, testing, adjusting, and balancing of equipment shall be repaired to the satisfaction of Resident Engineer. Field painting shall be as specified in Specification Section 09900, "Painting and Coating".

PART 3 EXECUTION

3.01 INSPECTION

A. Before testing and balancing the air system, doors and windows surrounding the area served by the system shall be closed. Fans shall be checked for correct rotation and rotative speed. Dampers shall be open and access doors and panels shall be closed during the testing and balancing period.

B. A resistance shall be placed at all filter locations to simulate dirty filter conditions. The filter resistance shall be as follows:

Filter Type	Simulated Loss
1 inch pleated	0.15 inch water column
2 inch pleated	0.35 inch water column

3.02 STARTUP REQUIREMENTS

A. System equipment shall be subject to preliminary field tests as indicated in Specification Section 01650, "Startup Requirements".

3.03 FIELD PERFORMANCE TESTING

A. Field performance tests shall be conducted for each system to demonstrate each is functioning as specified and to the satisfaction of Resident Engineer. All tests shall be conducted in a manner acceptable to Resident Engineer and shall be repeated as many times as necessary to secure Resident Engineer's acceptance of each system. If inspection or tests indicate defects, the defective item or material shall be replaced, and the inspection and tests shall be repeated. All repairs to piping shall be made with new materials. Caulking of threaded joints or holes will not be acceptable.

B. Air filters which are subject to a pressure loss exceeding the dirty filter values shall be removed and replaced. The spare air filters furnished with equipment shall not be used as the replacement filters. Dirty filter values shall be as follows:

Filter Type	Dirty Filter Conditions
1 inch pleated	0.75 inch water column
2 inch pleated	1 inch water column

3.04 CLEANING

A. At the completion of the testing, all parts of the installation shall be thoroughly cleaned. All equipment, ductwork, pipes, valves, and fittings shall be cleaned of grease, debris, metal cuttings, and sludge. Any stoppage, discoloration, or other

damage to parts of the building, its finish, or furnishings shall be repaired by Contractor at no additional cost to The City.

3.05 ADJUSTING & BALANCING

A. The air system shall be adjusted and balanced.

B. All instrumentation shall be calibrated within 6 months of use and shall be checked for accuracy before testing, adjusting, and balancing the systems. The accuracy of the instrumentation shall be not less than specified by the testing, adjusting, and balancing standard manual or the instrument manufacturer.

C. All data, including system deficiencies encountered and corrective measures taken, shall be recorded. If a system cannot be adjusted to meet the design requirements, Contractor shall notify Resident Engineer in writing as soon as practicable.

D. Following final acceptance of the certified balancing reports, the testing and balancing contractor shall permanently mark the settings of all adjustment devices, including valves and dampers, and shall lock the memory stops.

E. All ceiling tiles, belt guards, panels, and doors removed during testing, adjusting, and balancing shall be reinstalled.

F. Air Systems

1. Air systems shall be adjusted to the design airflows indicated on the drawings. Airflows shall be adjusted to maintain a net positive (supply airflow greater than exhaust airflow) or negative (exhaust airflow greater than supply airflow) pressure as indicated on the drawings. Dampers located behind air outlet and inlet devices shall be used to adjust the airflow only to the extent that the adjustments do not create objectionable air movement or noise.

G. Dampers with operators shall be checked for tight shutoff when in the closed position.

END OF SECTION

SECTION 16040
ELECTRIC MOTORS

PART 1 -- GENERAL

1.1 WORK OF THIS SECTION

A. The Contractor shall provide electric motors, accessories, and appurtenances, complete and operable, in accordance with the Contract Documents. The provisions of this Section apply to all electric motors.

1.2 RELATED SECTIONS

A. The Work of the following Section applies to the Work of this Section. Other Sections, not referenced below, shall also apply to the extent required for proper performance of this Work.

1. Section 16050 Basic Electrical Materials and Methods

1.3 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

A. Except as otherwise indicated, the current editions of the following apply to the Work of this Section:

1. ANSI/NEMA MG 1	Motor and Generator
2. ANSI/NEMA MG12.53	Motor Testing
3. ANSI/IEEE 112	Standard Test Procedure for Polyphase Induction Motors and Generators
4. IEEE 43	Recommended Practice for Testing Resistance of Rotating Machinery
5. IEEE 841	Recommended Practice for Chemical Industry Severe-Duty Squirrel Cage Induction Motors
6. IEEE RP-841	Recommended Practice for Chemical Industry Severe Duty Squirrel Cage Induction Motors

1.4 CONTRACTOR SUBMITTALS

A. Shop Drawings and Catalog Data: Submit shop drawings and catalog data submittals in accordance with Section 01300 - *Submittals*.

B. Motor Data: Complete motor data shall be submitted in the shop drawings for driven

machinery. Motor data shall include:

1. Machine name and specification number of driven machine.
2. Name of the motor manufacturer.
3. Motor type or model and dimension drawing. Include motor weight.
4. Nominal horsepower.
5. NEMA design.
6. Enclosure.
7. Frame size.
8. Winding insulation class and temperature rise class.
9. Voltage, phase and frequency ratings.
10. Service factor.
11. Full load current at rated horsepower for application voltage.
12. Full load speed.
13. Guaranteed minimum full load efficiency. Also provide nominal efficiencies at 2 and 3/4 load.
14. Type of thermal protection or overtemperature protection, if included.
15. Wiring diagram for devices such as motor leak detection, temperature, or zero speed switches, as applicable.
16. Bearing data with recommended lubricants for relubricatable type bearings.
17. If used with a variable frequency controller, verify motor is inverter duty type. Include minimum speed at which motor may be operated for the driven machinery.
18. Power factor at 2, 3/4 and full load.
19. Recommended size for power factor correction capacitors to improve power factor to 0.95 (lagging) when operated at full load.

C. Water Cooling: If water cooling is required for motor thrust bearings, the shop drawings shall indicate this requirement.

PART 2 -- PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Identical Motors: Electric motors driving identical machines shall be identical.

B. Maximum Motor Loading: Maximum motor loading shall in all cases be equal to nameplate horsepower rating or less, exclusive of service factor and as verified with the approved submittal data of the driven machinery.

C. Minimum Motor Horsepower: All motors shall be sized to carry continuously all loads which may be imposed through their full range of operation. The motor horsepower shall be not less than the estimated minimum specified for each driven machine. If the estimated minimum horsepower specified is not adequate to satisfy the foregoing restrictions or any other requirements of these Specifications, the motor with the required horsepower shall be supplied at no additional cost to the City. In addition, any changes caused by increase in motor horsepower shall be made by the Contractor at no additional cost to the City; such changes may involve circuit breakers, magnetic starters, motor feeder conductors, conduit sizes, etc.

D. Exempt Motors: Motors which are for valve operators, submersible pumps, or motors which are an integral part of standard manufactured equipment, i.e., non-NEMA mounting, common shaft with driven element, part of domestic or commercial use apparatus may be excepted from these Specifications to the extent that such variation reflects a necessary condition of motor service or a requirement of the driven equipment.

2.2 DESIGN REQUIREMENTS

A. General: All electric motors shall comply with ANSI/NEMA MG 1 - Motor and Generator.

B. NEMA Design: Electric motors shall be NEMA Design B, (except as indicated in Equipment Specifications for motors controlled for variable speed operation and other special motors,) constant speed squirrel-cage induction motors having normal starting torque with low starting current. In no case shall starting torque or breakdown torque be less than the value in ANSI/NEMA MG 1. Motors shall be suitable for the starting method indicated on the Electrical Drawings.

C. Motor Voltage Ratings: Motors shall have voltage ratings in accordance with the following, unless otherwise indicated:

1. Motors below 2 hp shall be rated 115 V, single-phase, 60-Hz. Dual voltage motors rated 115/230 V, 115/208 V, or 120-240 V are acceptable, provided all leads are brought out to the conduit box.

2. Motors 2 hp and larger shall be rated 230 V, or 460 V, 3-phase, 60-Hz, as required

and as indicated. Dual voltage motors rated 230/460 V or 208/230/460 V are acceptable, provided all loads are brought out to the conduit box.

D. Insulation: All three-phase motors shall be furnished with Class F insulation, rated to operate at a maximum ambient temperature of 104 degrees F and at the altitudes where the motors will be installed and operated, without exceeding Class B temperature rise limits stated in ANSI/NEMA MG 1-12.42. Single phase motors shall have Class F insulation with temperature rise not to exceed the insulation class.

E. Motors in Nonhazardous Areas: Motors 50 hp or smaller located in nonhazardous areas shall be totally enclosed, fan cooled with a service factor of 1.15 unless otherwise indicated. Motors larger than 50 hp and up to 200 hp located in nonhazardous areas shall be open drip-proof (ODP) with a service factor of 1.15.

F. Motors in Hazardous Areas: Motors for use in hazardous areas shall have enclosures suitable for the classification shown on the Drawings. Such motors shall be UL listed and stamped as such.

G. Motors for Use Outdoors: Motors for 25 hp and larger for use outdoors shall have space heaters. Space heaters shall be 120 VAC.

H. High Efficiency Motors:

1. Motors with a nameplate rating of 1 hp and above shall be "high efficiency" units. Motors shall be stamped with the efficiency on the nameplate with the caption "NEMA Nominal Efficiency" or "NEMA Nom. Eff." Such motors shall have efficiencies determined by the test as set forth in ANSI/IEEE 112-Standard Test Procedure for Polyphase Induction Motors and Generators, Method B.

2. Efficiency Index: Efficiency index, nominal efficiency, and minimum efficiency shall be defined in accordance with ANSI/NEMA MG 12.53 - Motor Testing; these values shall be stated in the shop drawing submittal.

3. High efficiency motors shall conform to the guaranteed minimum, full-load efficiency requirement presented in the schedule at the end of this Section.

I. Motors intended for use with variable frequency drives (VFDs) shall be compatible with the characteristics of the VFD. Motor nameplate shall specify inverter duty type motor.

J. All two-speed motors shall be of the two-winding type.

2.3 ACCESSORY REQUIREMENTS

A. General: Horizontal motors 3 hp and larger, and all vertical motors, shall have split-type cast metal conduit boxes. Motors other than open drip-proof shall be gasketed. Motors less than 3 hp shall have the manufacturer's standard conduit boxes.

B. Lifting Devices: All motors weighing 265 pounds or more shall have suitable lifting eyes for installation and removal.

C. Special Requirements: Refer to individual equipment specifications for special requirements such as motor winding thermal protection, multispeed windings, etc.

D. Grounding Lugs: Provide motor grounding lug suitable to terminate ground wire, sized as indicated on the Drawings.

E. Nameplate: All motors shall be fitted with a permanent, stainless steel nameplate indelibly stamped or engraved with NEMA Standard motor data, in conformance with NEMA MG-1- 10.40.

F. Power Factor Correction Capacitors: The motor manufacturer shall furnish for installation by the Electrical Contractor power factor correction capacitors for each motor 10 hp and larger, and started with FVNR, FVR, FVNR-AT (auto-transformer) or FVTS (two-speed, high speed winding corrected) starters only. Motors started with solid state starters or VFDs shall not have capacitors. The capacitors shall be fused, with internal resistors, suitably enclosed for mounting adjacent to the starter, MCC, or the motor, and sized to improve power factor to not less than 95% at full load. Size shall be as recommended by the motor manufacturer. The capacitors shall be wired to the motor starter output terminals. Dielectric fluid shall be non-PCB, biodegradable and non-flammable.

2.4 MOTOR THERMAL PROTECTION

A. Single Phase Motors: All single-phase 120, 208, or 230 V motors shall have integral thermal overload protection or shall be inherently current limited.

B. Thermostats: Winding thermostats where specifically indicated shall be snap action, bi-metallic, temperature-actuated switch. Thermostats shall be provided with one normally closed contact. The thermostat switch point shall be precalibrated by the manufacturer.

C. RTDs: Bearing RTDs and/or winding RTDs (two per phase) shall be provided where specifically indicated. RTDs shall be 100-ohm platinum.

2.5 MOTOR BEARINGS

A. Bearing Life: All motors greater than 2 hp shall have bearings designed for a minimum rated L- 10 life of 10 years or 100,000 hours, whichever comes first.

B. Fractional Horsepower: Fractional horsepower through 2-hp motors shall be furnished with Lubricated-for-Life ball bearings.

C. Horizontal Motors Over 2 Horsepower: Motors larger than 2 hp shall be furnished with relubricatable ball bearings.

D. Vertical Motors Over 2 Horsepower: Vertical motors larger than 2 hp shall be furnished with relubricatable ball, spherical, roller, or plate type thrust bearings. Lubrication shall be per manufacturer's recommendation for smooth operation and long life of the bearings.

E. Water Cooled Motors: If water cooling is required for the thrust bearings, cooling water lines shall be provided complete with shut-off valve, strainer, solenoid valve, flow indicator, thermometer, throttling valve and, (where subject to freezing), insulation with heat tracing.

2.6 MANUFACTURERS

A. The Contractor's designated equipment supplier shall have the responsibility to select and supply suitable electric motors for the driven equipment. The choice of motor manufacturer shall be subject to review by the Resident Engineer. Such review will consider the future availability of replacement parts and compatibility with driven equipment. Acceptable manufacturers include the following, or approved:

1. U.S. Motors.
2. Reliance Electric.
3. Louis Allis (Division of Magnetek, Inc.)
4. Marathon Electric Manufacturing Co.
5. Siemens Energy & Automation, Inc.

PART 3 -- EXECUTION

3.1 INSTALLATION

A. Motor installation shall be performed in accordance with the motor manufacturer's written recommendations and the written requirements of the manufacturer of the driven equipment.

B. Electrical work involving connections, controls, switches, and disconnects, shall be as indicated in Section 16050, *Basic Electrical Materials and Methods*..

C. Capacitors shall be connected to the output terminals of the motor starter. Motor overload elements shall be adjusted downwards to reflect the reduction in line current resulting from power factor correction.

3.2 FACTORY TESTING

A. Motors rated 100 hp and larger shall be factory tested in conformance with ANSI/IEEE 112, IEEE 43 - Recommended Practice for Testing Resistance of Rotating Machinery, and NEMA MG-2. Test reports shall include heat run, performance, bearing (temperature, noise), locked rotor, speed torque, no-load saturation, surge, and

megohmmeter/dielectric absorption ratio. Test report shall indicate test procedure and instrumentation used to measure and record data. Test report shall be certified by the motor manufacturer's test personnel and be submitted.

3.3 FIELD TESTING

A. The Contractor shall perform the following field tests:

1. Inspect each motor installation for any deviation from rated voltage, phase or frequency; or improper installation.

2. Visually check for proper phase and ground connections. Verify that multivoltage motors are connected for proper voltage.

3. Check winding and bearing temperature detectors and space heaters for functional operation.

4. Test for proper rotation before connection to the driven equipment.

5. Test insulation (megger test) of all new as well as reused motors in accordance with NEMA MG-1. Test voltage shall be 1000 VAC plus twice the rated voltage of the motor.

High Efficiency Motor Guaranteed Minimum Efficiency Requirements at Full Load

OPEN DRIP-PROOF (ODP)								
	3600 RPM		1800 RPM		1200 RPM		900 RPM	
HP	Nom. Effic.	Min. Effic.	Nom. Effic.	Min. Effic.	Nom. Effic.	Min. Effic.	Nom. Effic.	Min. Effic.
1.0	--	--	82.5	80.0	77.0	74.0	72.0	68.0
1.5	80.0	77.0	82.5	80.0	82.5	80.0	75.5	72.0
2.0	82.5	80.0	82.5	80.0	84.0	81.5	85.5	82.5
3.0	82.5	80.0	86.5	84.0	85.5	82.5	86.5	84.0
5.0	85.5	82.5	86.5	84.0	86.5	84.0	87.5	85.5
7.5	85.5	82.5	88.5	86.5	88.5	86.5	88.5	86.5
10.0	87.5	85.5	88.5	86.5	90.2	88.5	89.5	87.5
15.0	89.5	87.5	90.2	88.5	89.5	87.5	89.5	87.5
20.0	90.2	88.5	91.0	89.5	90.2	88.5	90.2	88.5

25.0	91.0	89.5	91.7	90.2	91.0	89.5	90.2	88.5
30.0	91.0	89.5	91.7	90.2	91.7	90.2	91.0	89.5
40.0	91.7	90.2	92.4	91.0	91.7	90.2	90.2	88.5
50.0	91.7	90.2	92.4	91.0	91.7	90.2	91.7	90.2
60.0	93.0	91.7	93.0	91.7	92.4	91.0	92.4	91.0
75.0	93.0	91.7	93.6	92.4	93.0	91.7	93.6	91.0
100.0	93.0	91.7	93.6	92.4	93.6	92.4	93.6	92.4
125.0	93.0	91.7	93.6	92.4	93.6	92.4	93.6	92.4
150.0	93.6	92.4	94.1	93.0	93.6	92.4	93.6	92.4
200.0	93.6	92.4	94.1	93.0	94.1	93.0	93.6	92.4

OPEN DRIP-PROOF (ODP)								
	3600 RPM		1800 RPM		1200 RPM		900 RPM	
HP	Nom. Effic.	Min. Effic.	Nom. Effic.	Min. Effic.	Nom. Effic.	Min. Effic.	Nom. Effic.	Min. Effic.
250.0	95.0	92.4	95.8	93.0	95.0	93.0	95.0	93.6

TOTALLY ENCLOSED - FAN COOLED (TEFC)								
	3600 RPM		1800 RPM		1200 RPM		900 RPM	
HP	Nom. Effic.	Min. Effic.	Nom. Effic.	Min. Effic.	Nom. Effic.	Min. Effic.	Nom. Effic.	Min. Effic.
1.0	--	--	80.0	77.0	75.5	72.0	72.0	68.0
1.5	78.5	75.5	81.5	78.6	82.5	80.0	75.5	72.0
2.0	81.5	78.5	82.5	80.0	82.5	80.0	82.5	80.0
3.0	82.5	80.0	84.0	81.5	84.0	81.5	81.5	78.5
5.0	85.5	82.5	85.5	82.5	85.5	82.5	84.0	81.5
7.5	85.5	82.5	87.5	85.5	87.5	85.5	85.5	82.5
10.0	87.5	85.5	87.5	85.5	87.5	85.5	87.5	85.5

15.0	87.5	85.5	88.5	86.5	89.5	87.5	88.5	86.5
20.0	88.5	86.5	90.2	88.5	89.5	87.5	89.5	87.5
25.0	89.5	87.5	91.0	89.5	90.2	88.5	89.5	87.5
30.0	89.5	87.5	91.0	89.5	91.0	89.5	90.2	88.5
40.0	90.2	88.5	91.7	90.2	91.7	90.2	90.2	88.5
50.0	90.2	88.5	92.4	91.0	91.7	90.2	91.0	89.5
60.0	91.7	90.2	93.0	91.7	91.7	90.2	91.7	90.2
75.0	92.4	91.0	93.0	91.7	93.0	91.7	93.0	91.7
100.0	93.0	91.7	93.6	92.4	93.0	91.7	93.0	91.7
125.0	93.0	91.7	93.6	92.4	93.0	91.7	93.6	92.4
150.0	93.0	91.7	94.1	93.0	94.1	93.0	93.6	92.4

TOTALLY ENCLOSED - FAN COOLED (TEFC)								
	3600 RPM		1800 RPM		1200 RPM		900 RPM	
HP	Nom. Effic.	Min. Effic.	Nom. Effic.	Min. Effic.	Nom. Effic.	Min. Effic.	Nom. Effic.	Min. Effic.
200.0	94.1	93.0	94.5	93.6	94.1	93.0	94.1	93.0
250.0	95.8	93.6	96.2	93.6	95.8	93.6	95.8	93.6

END OF SECTION

SECTION 16050
BASIC ELECTRICAL MATERIALS AND METHODS

PART 1 -- GENERAL

1.1 WORK OF THIS SECTION

A. The Contractor shall provide electrical and appurtenant Work necessary for a complete and operable electrical system, in accordance with the Contract Documents.

B. The Contractor shall make all field connections and terminations to all motors, switchgear, panels, control equipment and devices, instruments, and to all vendor-furnished packaged equipment. The requirements of this Section shall apply to all electrical items indicated in Division 16 unless otherwise indicated.

C. The Contractor shall provide all materials and incidentals required to complete the electrical work. Typical materials which may be incidentals are terminal lugs not furnished with vendor-supplied equipment, compression connectors for cables, splices, junction and terminal boxes, and all control wires required by vendor-furnished equipment to interconnect with other equipment all specifically indicated on the Contract Documents.

D. All concrete work required for encasement, installation, or construction of the Work specified in Division 16 shall be 3000-psi concrete conforming to the applicable requirements of Section 03300 - Cast-in-Place Concrete; provided, that the following exceptions and supplementary requirements shall apply:

1. Consolidation of encasement concrete around duct banks shall be by hand puddling, and no mechanical vibration shall be permitted.

2. A workability admixture shall be used in encasement concrete, which shall be a hydroxylated carboxylic acid type in liquid form. Admixtures containing calcium chloride shall not be used.

3. Concrete for encasement of conduit or duct banks shall contain an integral red-oxide coloring pigment in the proportion of 8 pounds per cubic yard of concrete.

1.2 RELATED SECTIONS

A. The Work of the following Sections applies to the Work of this Section. Other Sections, not referenced below, shall also apply to the extent required for proper performance of this Work.

1. Section 02200 Earthwork
2. Section 03300 Cast-In-Place Concrete
3. Section 16400 Low Voltage Electrical Service and Distribution
4. Section 16421 Surge Arrestors

5. Section 16700 Supervisory Control Data Acquisition (SCADA)
6. Section 16900 Controls and Instrumentation
7. Section 16950 Electrical Tests

1.3 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. Codes and Standards:

NEC	National Electrical Code, latest edition

B. Government Standards:

FS W-C-596E/GEN(1)	Connector, Plug, Receptacle and Cable Outlet, Electrical Power
FS W-S-896E/GEN(1)	Switches, Toggle (Toggle and Lode), Flush Mounted (ac)
FS WW-C-563	Electrical Metallic Tubing (EMT)
FS WW-C-581D, E	Conduit, Metal, Rigid, And Intermediate; And Coupling, Elbow, and Nipple, Electrical Conduit: Steel, Zinc Coated

C. Commercial Standards:

ANSI C80.1	Zinc Coated, Rigid Steel Conduit, Specification for
ANSI C80.4	Fittings for Rigid Metal Conduit and Electrical Metallic Tubing, Specifications for
ANSI/UL 467	Grounding and Bonding Equipment, Safety Standard for
ASTM B3	Soft or Annealed Copper Wire
ASTM B8	Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, and Soft
ASTM B33	Specification for Timed Soft or Annealed Cooper Wire for Electrical Purposes
ICEA S-61-402	Thermoplastic - Insulated Wire and Cable
ICEA S-66-524, NEMA WC7	Cross-Linked, Thermosetting, Polyethylene Wire and Cable
ICEA S-68-516, NEMA WC8	Ethylene Propylene Rubber Insulated Wire and Cable
NEMA 250	Enclosures for Electrical Equipment (1,000 volts maximum)

NEMA PB-1	Panelboards
UL 6	Rigid Metal Electrical Conduit
UL 44	Rubber - Insulated Wire and Cable.
UL 514	Electrical Outlet Boxes and Fittings
UL 886	Electrical Outlet Boxes and Fittings for Use in Hazardous Locations
UL 1072	Medium Voltage Cable, Type MV-90

D. All equipment furnished by the Contractor shall be listed by and shall bear the label of Underwriters' Laboratories, Incorporated (UL), or of an independent testing laboratory acceptable to the local code-enforcement agency having jurisdiction.

E. In addition to other regulatory requirements, the Work of this Section shall comply with the requirements of the current edition of the Standard Specifications for Public Works Construction (SSPWC) Subsection 209-1, together with the latest adopted editions of the Regional and City of San Diego Supplement Amendments.

F. The construction and installation of all electrical equipment and materials shall comply with all applicable provisions of the OSHA Safety and Health Standards (29CFR1910 and 29CFR1926, as applicable), State Building Standards, and applicable local codes and regulations.

1.4 PUBLIC UTILITIES REQUIREMENTS

A. The Contractor shall contact the San Diego Gas and Electric Company and verify compliance with their requirements before construction begins.

B. Electrical service shall be as indicated by the Contract Documents.

C. The Contractor shall verify, furnish, and install all service conduits, fittings, transformer pad, grounding devices, and all service wires not furnished by the serving utility.

D. The Contractor shall verify with the utility the exact location of each service point and type of service, and shall pay all charges levied by the serving utilities without additional cost to the City.

1.5 PERMITS AND INSPECTION

A. The Contractor shall obtain permits and pay for inspection fees as indicated in the Contract Documents.

B. The Contractor shall pay for any service charges required by the utility company for connection and activation.

1.6 SUBMITTALS

A. Shop Drawings and Catalog Data: The Contractor shall submit shop drawings and catalog data submittals in accordance with Section 01300 - Submittals.

B. Material Lists: The Contractor shall submit complete material lists for the Work of this Section. Such lists shall state the manufacturer and brand name of each item or class of material. The Contractor shall submit shop drawings for all grounding work not specifically indicated.

C. Shop Drawing Content: Shop drawings are required for materials and equipment listed in other Sections. Shop drawings shall provide sufficient information to evaluate the suitability of the proposed material or equipment for the intended use, and for compliance with these Specifications. The following shall be included:

1. Front, side, rear elevations and top views with dimensional data.

2. Location of conduit entrances and access plates.

3. Component data.

4. Connection diagrams, terminal numbers, wire numbers, internal wiring diagrams, conductor size, and cable numbers.

5. Method of anchoring, seismic requirement; weight.

6. Types of materials and finish.

7. Nameplates.

8. Temperature limitations, as applicable.

9. Voltage requirement, as applicable.

10. Front and rear access requirements.

D. Catalog Data: Catalog data shall be submitted to supplement all shop drawings. Catalog cuts, bulletins, brochures, or the like or photocopies of applicable pages thereof shall be submitted for mass produced, non-custom manufactured material. These catalog data sheets shall be stamped to indicate the project name, applicable Specification section and paragraph, model number, and options. This information shall be marked in spaces designated for such data in the stamp.

E. Materials and Equipment Schedules: The Contractor shall furnish within 30 days, a complete list of all materials, equipment, apparatus, and fixtures proposed for use. The list shall include type, sizes, names of manufacturers, catalog numbers, and such other information required to identify the items.

F. Manuals: The Contractor shall furnish manuals as part of the shop drawing submittals under

"Manuals" in Section 01300 - Submittals.

G. Record Drawings: In addition to the record drawings as a part of the record drawing requirements specified in Section 01720 - Field Record Documents, the Contractor shall show depths and routing of all duct bank concealed below grade electrical installations.

1.7 QUALITY ASSURANCE

A. Field Control of Location and Arrangement: The Drawings diagrammatically indicate the desired location and arrangement of outlets, conduit runs, equipment, and other items. The Contractor shall determine the exact locations in the field based on the physical size and arrangement of equipment, finished elevations, and other obstructions. Locations shown on the Drawings, however, shall be adhered to as closely as possible.

B. Equipment Locations: All conduit and equipment shall be installed in a manner to avoid all obstructions and to preserve head room and keep openings and passageways clear. Lighting fixtures, switches, convenience outlets, and similar items shall be located within finished rooms, as shown. Where the Drawings do not indicate exact locations, such locations shall be obtained from the Resident Engineer Where equipment is installed without instruction and must be moved, it shall be moved without additional cost to the City.

C. Workmanship: All materials and equipment shall be installed in accordance with printed recommendations of the manufacturer which have been reviewed by the Resident Engineer. The installation shall be accomplished by workmen skilled in this type of work and installation shall be coordinated in the field with other trades so that interferences are avoided.

D. Quality of Work: All Work, including installation, connection, calibration, testing, adjustment, and paint touchup, shall be accomplished by qualified, experienced personnel working under continuous, competent supervision. The completed installation shall display competent work, reflecting adherence to prevailing industrial standards and methods.

E. Protection of Equipment and Materials: The Contractor shall furnish adequate means for and shall fully protect all finished parts of the materials and equipment against damage from any cause during the progress of the Work and until acceptable by the Resident Engineer.

F. Protection: All materials and equipment, both in storage and during construction, shall be covered in such a manner that no finished surfaces will be damaged, marred, or splattered with water, foam, plaster, or paint. All moving parts shall be kept clean and dry.

G. Damaged Materials and Equipment: The Contractor shall replace or have refinished by the manufacturer, all damaged materials or equipment, including face plates of panels and switchboard sections, at no expense to the City.

H. Tests: The Contractor shall perform all tests required by the Resident Engineer or other authorities having jurisdictions. All such tests shall be performed in the presence of the Resident Engineer. The Contractor shall furnish all necessary testing equipment and pay all costs of tests, including all replacement parts and labor necessary due to damage resulting from

damaged equipment or from test and correction of faulty installation. The following testing shall be accomplished:

1. Testing for the ground resistance value under "Grounding," below.

2. Insulation resistance tests under "Wire and Cable," below.

3. Operational testing of all equipment furnished and/or connected in other Sections of Division 16, including furnishing of support labor for testing.

I. Standard test reports for mass-produced equipment shall be submitted along with the shop drawing for such equipment. Test reports on testing specifically required for individual pieces of equipment shall be submitted for review prior to final acceptance of the project.

J. Any test failure shall be corrected in accordance with the industry practices and in a manner satisfactory to the Resident Engineer.

1.8 AREA DESIGNATIONS

A. General: For purposes of delineating electrical enclosure and electrical installation requirements of this project, certain areas have been classified in the Contract Documents as defined below. Electrical installations within these areas shall conform to the referenced code requirements for the area involved.

B. General Purpose [Indoor] Locations: Electrical work installed in areas which are not otherwise specifically classified shall be "General Purpose." Workmanship and enclosures shall comply with the general requirements of these Specifications. Electrical enclosures shall be NEMA Type 1.

C. Outdoor and Damp Locations: In outdoor locations, raceway shall be rigid galvanized steel (GRS) conduit; entrances shall be threaded; and fittings shall have gasketed covers. Provisions shall be made to drain the fitting or conduit system. Threaded fastening hardware shall be stainless steel. Raceway supports such as hanger rods, clamps, and brackets shall be galvanized. Attachments or welded assemblies shall be galvanized after fabrication. Instruments and control cabinets, and panel enclosures shall be NEMA Type 4X; enclosure shall be stainless steel. Switchboards shall be weatherproof NEMA Type 3R. Enclosures shall be mounted 1 inch from walls to provide an air space. Locations which are indoors and 2 feet below grade elevation or which are classified as damp locations on the Drawings shall have electrical installations which conform to the requirements for outdoor locations. "Damp locations" shall include pump room, valve vaults, and metering vaults. All rooms housing liquid handling equipment are also classified as damp locations regardless of grade elevation.

D. Splash Locations: Areas shown as splash proof shall have electrical installations as described for "outdoor locations."

1.9 CLEANUP

A. Cleaning of Materials and Equipment: In addition to the clean-up requirements of Section

01770 - Closeout Procedures, all parts of the materials and equipment shall be thoroughly cleaned. Exposed parts shall be thoroughly clean of cement, plaster, and other materials. All oil and grease spots shall be removed with a nonflammable cleaning solvent. Such surfaces shall be carefully wiped and all cracks and corners scraped out. Paint touchup shall be applied to all scratches on panels and cabinets. Electrical cabinets or enclosures shall be vacuum cleaned before final acceptance.

B. Cleaning of the Site: During the progress of the Work, the Contractor shall clean the premises and leave the premises and all portions of the site free of debris.

1.10 DEMOLITION AND RELATED WORK

A. Demolition Work: The Contractor shall perform all electrical demolition work as indicated.

1. Electrical equipment and components, terminal and relay cabinets, MCCs, shall be returned to the City in an orderly fashion to a designated location on the site.

2. Wire, conduit, junction boxes, fittings, supports and miscellaneous hardware removed as part of the demolition work shall not be reused and shall be returned to the City.

3. Wires and/or conduits that need to be extended shall be terminated in a new terminal box with terminal strips. Terminal box shall be properly sized by the Contractor. In outdoor installation, the terminal box shall be NEMA 4X 304 stainless steel. Wires and terminals shall be properly identified before disconnection and after reconnection.

4. Wiring in conduits located in or under slabs shall be removed. The conduit shall be plugged level with the floor where practical. In other cases, the conduit shall be cut three inches below the finished floor and the area shall be resurfaced.

5. Openings in walls and platforms created by the removal of conduit or electrical equipment shall be patched with materials similar to those in surrounding work areas or as required to provide proper sealed conditions as reviewed and accepted by the Resident Engineer.

6. Electrical demolition shall be as shown on the Drawings or as required by the Specifications.

7. The Contractor shall exercise due care in the removal of the equipment made surplus by this project so as not to impair its resale value or reuse. The City has the right to salvage any wire or other electrical equipment removed from the project.

B. Installation of New Equipment in Existing Structures:

1. Installation of certain new equipment and devices is required in existing structures. For this phase of the Work, the Contractor shall remove existing equipment or devices, install new equipment as indicated, remove existing conductors from existing raceways, and pull new conductors in existing raceways, reconnect existing conductors or furnish and

install new conduit and wires.

2. The Contractor shall visit the site before bidding and carefully examine existing installation so that its proposal will reflect all the Work necessary to provide a complete installation so that the resulting installation will function as required. Include in the bid price all costs of labor and materials necessary to complete installations.

C. Installation of Temporary Equipment:

1. To facilitate continuous operation of existing equipment, temporary equipment shall be provided where indicated. The Contractor shall submit installation and connection details for review and acceptance. Temporary installations shall provided at no additional cost to the City.

2. All cables, conduits, and fittings used in temporary connections shall not be reused to install permanent connections. Salvaged items shall be returned to the City.

D. Plant Monitoring Power and Control Shutdowns:

1. Existing plant operation shall be continued during this expansion process. The Contractor shall carefully examine all Work to be done in, on, or adjacent to existing equipment. Work shall be scheduled, subject to the City 's approval, to minimize required plant shutdown time. The Contractor shall submit a written request, including sequence and duration of activities to be performed during plant shutdown.

2. The Contractor shall perform all switching and safety tagging required for plant shutdown or to isolate existing equipment. In no case shall the Contractor begin any Work in, on, or adjacent to existing equipment without written authorization of the Resident Engineer.

E. Modifications to Existing Electrical Facilities:

1. The Contractor shall provide all modifications or alterations to existing electrical facilities required to successfully install and integrate the new electrical equipment. All modifications to existing equipment, panels, or cabinets shall be made in a professional manner with all coatings repaired to match existing. Modifications to existing electrical facilities required for a complete and operating system shall be made at no additional cost to the City. Extreme caution shall be exercised in digging trenches in order not to damage existing underground utilities. Cost of repairs of damages caused during construction shall be the Contractor 's responsibility.

2. The Contractor shall verify all available existing circuit breakers in lighting panels for their intended use as required by the Drawings. At no additional cost to the City, the Contractor shall verify the available space in substation switchboards to integrate new power circuit breakers.

PART 2 -- PRODUCTS

2.1 GENERAL

A. All equipment and materials shall be new, shall be listed by UL, and shall bear the UL label where UL requirements apply. All equipment and materials shall be the products of experienced and reputable manufacturers in the industry. Similar items in the project shall be products of the same manufacturer. All equipment and materials shall be of industrial grade and standard of construction; shall be of sturdy design and manufacture; and shall be capable of reliable, trouble-free service.

2.2 GROUNDING

A. General: All components of the grounding electrode system shall be manufactured in accordance with UL 467 and shall conform to the applicable requirements of NEC Article 250.

B. Grounding Cable: Grounding cable shall be copper. Bare copper wire shall be annealed, No. 8 AWG minimum, if not called out in the Drawings.

C. Ground Rods: Ground rods shall conform to ANSI/UL 467 and shall be 3/4-inch diameter copper-clad steel, sectional type, joined by threaded copper alloy couplings.

1 Grounding connectors shall be high-strength copper alloy suitable for direct burial.

2 Wire connections shall be exothermic weld by Cadweld of Erico Products for underground installation, or Burndy Hyground System using irreversible compression-type connectors for exposed aboveground installation.

3 Manufacturers of grounding materials shall be Copperweld, Blackburn, Burndy, or City approved equal.

2.3 UNDERGROUND DUCTS AND MANHOLES

A. General: Where an underground distribution system is required, it shall be comprised of multiple runs of single bore nonmetallic ducts, concrete encased, with steel reinforcing bars, with underground manholes and pullboxes. Nonmetallic ducts shall be rigid Schedule 40 PVC for concrete encasement.

1 Manholes and pullboxes shall be of precast concrete. Concrete construction shall be designed for traffic loading.

a. Covers shall be traffic type, except as shown otherwise. Manholes and pullbox covers designated as "HV" covers shall be identified as "High Voltage Electric," "P" shall be identified as "Secondary Electric," "C" as "Control" and "S" as "Signal." All covers shall be watertight after installation.

b. Manholes and pullboxes shall be equipped with pulling-in irons opposite and below each ductway entrance.

c. Manholes shall have concrete covers with 30-inch diameters lids. All covers and lids shall be bolted to cast-in-place frames with corrosion resistant hardware. Frames shall be factory-primed; covers shall be galvanized steel and shall have pick holes.

2 Manholes and pullboxes shall have cable supports so that each cable is supported at 3-foot intervals within the manhole or pullbox. Cable supports and racks shall be fastened with galvanized bolts and shall be fabricated of fiber glass or galvanized steel. Porcelain insulators for cable racks shall be provided.

3 Manholes and pullboxes shall be Brooks, Quikset, U.S. Precast, or City approved equal.

B. Concrete Envelope: The concrete envelope shall have a compression strength of 3000 psi in accordance with the requirements of Section 03300 - Cast-in-Place Concrete.

2.4 RACEWAYS

A. General: Raceway shall be manufactured in accordance with UL and ANSI standards and shall bear UL label as applicable.

B. Galvanized Rigid Steel (GRS) Conduit:

1 Rigid steel conduits and fittings shall be full weight, mild steel, hot-dip galvanized and zinc bichromate coated inside and outside after galvanizing.

2 Rigid steel conduit shall be manufactured in accordance with UL Standard No. 6 and ANSI C80.1.

3 Rigid steel conduit shall be manufactured by Triangle PWC, Republic Steel, or City approved equal.

4 Direct-buried or concrete encased under building floor slabs on grade: Use tape-wrapped GRS.

C. Rigid Nonmetallic Conduit: Rigid nonmetallic conduit shall be Schedule 40 PVC.

1 Nonmetallic conduits and fittings shall be UL listed, sunlight-resistant, and rated for use with 90 degrees C conductors.

24 Nonmetallic conduits and fittings shall be manufactured by Carlon, Condux, or City approved equal.

D. Electrical Metallic Tubing: Electrical metallic tubing (EMT) and fittings shall be galvanized inside

and out with an enamel coating inside and a chromate coating outside. EMT shall comply with ANSI C80.3.

E. Flexible Metallic Conduit: Flexible metallic conduit shall be fabricated from galvanized interlocked steel strip. Liquid-tight flexible metallic conduit shall have an extruded PVC covering over the flexible steel conduit. For conduit sizes 3/4 inch through 1-1/4 inches, flexible conduits shall have continuous built-in copper ground conductor. Flexible conduit shall be American Brass, Anaconda, Electroflex, or City approved equal. Explosion-proof flexible conduits shall be used for Class I, Div. 1, Group C&D areas.

2.5 WIRE AND CABLE

A. General: All conductors, including ground conductors, shall be copper. Insulation shall bear UL label and the manufacturer's trademark, type, voltage and temperature rating, and conductor size. Wire and cable shall be products of American, Rome Cable, Okonite, Houston, or City approved equal.

B. Control Cables: All control cables shall be rated for 600 V and shall meet the following requirements:

1 Control wires shall consist of No. 14 gage stranded copper conductors and shall be XHHW rated for 90 degrees C at dry locations and 75 degrees C at wet locations.

2 Control wires at panels and cabinets shall be machine tool grade type MTW, UL approved, rated for 90 degrees C at dry locations.

3 Multiconductor control cable shall be rated at 600 V and shall consist of No. 14 gauge stranded copper conductors, individually insulated with a minimum of 20 mils of polyethylene, 10 mils full color coded PVC jacket over each insulated conductor, a polyester tape over assembly, and an overall PVC jacket. Multiconductor cable shall be identified by either ICEA color coding or ink imprinting. Multiconductor cables may be used in conduits as required by the Drawings. Multipull taped control conductor assemblies may be used in conduits as approved by the Resident Engineer.

4 Multiconductor cable shall be rated 600 V, listed by UL as Type TC cable per Article 340 of the NEC. The individual conductors shall be UL listed as Type XHHW, with a sunlight-resistant overall jacket. The cables shall pass UL and IEEE-383 ribbon burner flame tests.

C. Instrumentation Cables: Shielded instrumentation cables shall be rated at 300 V and shall comply with the following requirements:

1 Individual shielded cable shall consist of twisted 2 or 3 No. 16 gauge, stranded, color coded, tinned-coated copper in accordance with ASTM B 33 - Specification for Tinned Soft or Annealed Copper Wire for Electrical Purposes and B 8 - Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, and Soft. Color coding shall be black-clear, or black-red-clear.

2 Insulation thickness shall be 32 mils of polyethylene, insulated with 2.3 mils 100% aluminum foil/polyester shield and No. 18 stranded tinned copper drain wire, all under a 32 mil PVC jacket. The shield shall be continuous and shall be grounded only at the receiving end, or as indicated.

3 Multi-individual shielded pair or triad instrumentation cable shall consist of individual shielded and twisted pair copper conductors with an ethylene-propylene insulation, and No. 18 AWG tinned stranded copper drain wire, an overall aluminum mylar shield and an overall chloro-sulfonated polyethylene compound jacket. The cables shall be be flame retardant.

4 Thermocouple Extension: Extension cable shall be provided for the type of thermocouple circuit indicated. Conductors shall be 16 AWG, solid allow, with 15 mils of 90 degree C flame-retardant polyvinylchloride insulation, twisted and covered with 100% 2.35 mil aluminum polyester tape and a 20 AWG, 7-strand, tinned-copper drain wire and a 35 mil, flame-retardant PVC jacket overall.

D. Building Wire and Cable: Building wires and cables shall be rated at 600 V and shall meet the following requirements:

1 Building wire shall be single conductor copper cable listed by UL as Type THHN/THWN rated 75 degrees C in wet locations and 90 degrees C in dry locations.

2 Building wire No. 8 AWG and larger shall be stranded; size No. 10 AWG and smaller shall be solid or stranded.

3 No wire smaller than No. 12 AWG shall be used unless specifically indicated.

E. Medium Voltage Cables: Medium voltage cables shall be rated at 15,000 V nominal and shall meet the following requirements:

1 Materials: Single conductor shall be uncoated copper, Class B stranded, conforming to ASTM B 3 and B 8.

2 Insulation shall be ethylene-propylene rubber (EPR) conforming to ICEA S-68-516 and S-19-81. Insulation level shall be 133%. Insulation shall be suitable for use in wet and dry locations at conductor operating temperatures not exceeding 90 degrees C for normal operation, 130 degrees C for overload conditions, and 250 degrees C for short-circuit conditions.

3 The conductor shall be covered with a layer of extruded semiconducting tape under the cable insulation. Insulation shall be covered with semiconducting nonmetallic tape and which over it shall be uncoated copper shielding tape helically applied.

4 Exterior jacket shall be a polyvinyl chloride jacket and shall meet the requirements of UL 1072 for sunlight resistance.

5 Medium voltage cable shall be UL listed as Type MV-90 and shall bear this label in accordance with UL 1072.

F. Cable Terminations: Cable terminations shall be in accordance with the following:

1 Compression connectors shall be Burndy "Hi Lug", Thomas & Betts "Shure Stake", or City approved equal. Threaded connectors shall be split bolt type of high strength copper alloy.

2 Spring connectors (wire nuts) shall be 3M "Scotch Lok," "Ideal Wing Nuts", or City approved equal.

3 Preinsulated fork tongue lugs shall be "Thomas & Betts" RC Series, Burndy, or City approved equal.

4 General purpose insulating tape shall be Scotch No. 33, Plymouth "Slip-knot", or City approved equal. High temperature tape shall be polyvinyl by Plymouth, 3M, or City approved equal.

5 Epoxy resin splicing kits shall be 3M Scotchcoat 82 Series, Burndy Hy Seal, or City approved equal.

6 Stress cone material for makeup of medium voltage shielded cable shall be by G & W, 3M, duPont, Raychem or City approved equal.

2.6 PULL AND JUNCTION BOXES

A. General: Outlet, switch, pull and junction boxes for flush-mounting in general purpose locations shall be one-piece, galvanized, pressed steel. Ceiling boxes for flush-mounting in concrete shall be galvanized, pressed steel.

B. Surface Mounted Boxes: Outlet, switch, pull and junction boxes where surface mounted in exposed locations shall be cast ferrous boxes with mounting lugs, zinc or cadmium plating, and enamel finish. Surface mounted boxes in concealed locations may be pressed steel.

C. Cast and Pressed Steel Boxes: All cast boxes and pressed steel boxes for flush mounting in concrete shall be fitted with cast, malleable box covers and gaskets. Covers for pressed steel boxes shall be one-piece pressed steel, cadmium plated, except that boxes for installation in plastered areas and finished rooms shall be stainless steel over plaster rings. Stainless steel plates shall be Sierra S-line, Hubbell, or City approved equal. Cast boxes shall be as manufactured by Crouse-Hinds, Appleton, or City approved equal.

D. Floor Boxes: Floor boxes shall have checker plate covers such as O-Z/Gedney Type "YR," or City approved equal. Surface boxes shall be O-Z/Gedney Type "YH," fully adjustable B2529 dual-level floor box by Hubbell, or City approved equal.

2.7 CONDUIT FITTINGS

A. General: Fittings shall comply with the same requirements as the raceway with which they will be used. Fittings having a volume less than 100 cubic inches for use with rigid steel conduit, shall be cast or malleable nonferrous metal. Such fittings larger than one inch shall be "mogul size." Fittings shall be of the gland ring compression type. Covers of fittings, unless in "dry" locations, shall be closed with gaskets. Surface-mounted cast fittings, housing wiring devices in outdoor and damp locations, shall have mounting lugs.

B. Insulated Bushings: Insulated bushings shall be molded plastic or malleable iron with insulating ring, similar to O-Z Type A and B, equivalent types by Thomas & Betts, Steel City, Appleton, O-Z/Gedney, or City approved equal.

C. Insulated Grounding Bushings: Insulated grounding bushings shall be malleable iron with insulating ring and with ground lug, such as O-Z Type BL, equivalent types by T & B, Steel City, O-Z/Gedney, or City approved equal.

D. Erickson Couplings: Erickson couplings shall be used at all points of union between ends of rigid steel conduits which cannot be coupled. Running threads and threadless couplings shall not be used. Couplings shall be 3-piece type such as Appleton Type EC, equivalent types such as manufactured by T & B, Steel City, O-Z/Gedney, or City approved equal.

E. Liquid-Tight Fittings: Liquid-tight fittings shall be similar to Appleton Type ST, equivalent types such as manufactured by Crouse-Hinds, T & B, O-Z/Gedney, or City approved equal.

F. Hubs: Hubs for threaded attachment of steel conduit to sheet metal enclosures, where required, shall be similar to Appleton Type HUB, equivalent types such as manufactured by T & B, Myers Scrutite, or City approved equal.

G. Transition Fittings: Transition fittings to mate steel to PVC conduit, and PVC access fitting, shall be as furnished or recommended by the manufacturer of the PVC conduit.

H. Expansion Fittings: Expansion fittings shall be installed wherever a raceway crosses a structural expansion joint. Such fittings shall be expansion and deflection type and shall accommodate lateral and transverse movement. Fittings shall be O-Z/Gedney Type "DX," Crouse Hinds "XD," or City approved equal. These fittings are required in metallic and nonmetallic raceway installations. When the installation is in a nonmetallic run, a 3-foot length of rigid conduit shall be used to connect the nonmetallic conduit to the fitting.

2.8 CABINETS AND ENCLOSURES

A. General: All electrical cabinets and enclosures housing control relays and terminal blocks shall be manufactured in accordance with NEMA Publications 250, UL Standards 50 and 508.

1 Relay or control, and terminal cabinets shall be NEMA 12 indoor and NEMA 4X SS outdoor. Sizes shown on the Drawings are minimum. Provide sufficient terminal blocks to

terminate 25% more conductors than are shown. Interiors of cabinets shall be finished white including internal back mounting plate.

2 Floor standing NEMA 12 construction shall have three-point latching mechanism operated by oil tight key-locking handle, and shall have gasketed overlapping doors. Steel construction shall be 12-gauge; construction for wall-mounted type shall be 14-gauge steel. Exterior finish shall be ANSI 61 light gray, or City approved equal.

3 Floor standing NEMA 4X enclosures shall be Type 304 stainless steel, 12-gauge, with oil-resistant door gaskets, stainless steel screws and clamps on the three sides of the door. Wall-mounted type construction shall be 14 gauge, Type 304 stainless steel.

B. Wiring of Cabinets: Wiring of terminal cabinets, control or relay cabinets shall be accomplished with stranded copper conductor rated for 600 V and UL listed as Type MTW. Wires for annunciator and indication circuits shall be No. 16 AWG. All others shall be No. 14 AWG. Color coding shall be as specified elsewhere in this Section. Incoming wires to terminal or relay cabinets shall be terminated on a master set of terminal blocks. All wiring from the master terminals to internal components shall be factory-installed and shall be contained in suitably sized plastic wireways having removable covers. Wiring to door-mounted devices shall be extra flexible and anchored to doors using wire anchors cemented in place. Exposed terminals of door-mounted devices shall be guarded to prevent accidental personnel contact with energized terminals.

C. Terminal Blocks: All terminal block requirements shall be as manufactured by WAGO with cage clamp, Phoenix, or City approved equal.

D. Nameplates: Nameplate engraving shall be as shown or as directed by the Resident Engineer. Characters shall be uniform block style not smaller than 1/8-inch. Nameplates shall be secured using cadmium plated steel or other corrosion resistant screws. Adhesive alone is not acceptable.

E. Testing: Each relay or control and terminal cabinets shall be completed, assembled, wired, and tested at the factory. Test shall be in accordance with the latest UL and NEMA Standards. All cabinets shall bear UL label, as applicable.

2.9 DISCONNECT SWITCHES

A. Disconnect Switches: Fused disconnect switches shall be externally operated with quick-make/quick-break mechanisms. The handle shall be interlocked with the switch cover by means of a defeatable interlock device. The switch shall be padlockable in the "off" position. Switches shall have nameplates stating manufacturer, rating, and catalog number. Heavy-duty switches shall have arc suppressors, pin hinges, and shall be horsepower rated at 600 V. All switches rated at 100 A or larger shall have auxiliary contact for remote status indication. Heavy-duty switches shall be provided for all motor circuits above 3 horsepower. In smaller motor circuits switches shall be general duty.

B. Ratings: Switch rating shall match the horsepower requirements of the load at the particular

voltage if not otherwise shown.

C. Enclosures: Switch enclosure shall be NEMA 12 indoor and NEMA 4X SS outdoor, and shall be as manufactured by Square D, Westinghouse, or City approved equal.

2.10 ELECTRICAL IDENTIFICATION

A. Nameplates: Nameplates shall be fabricated from white-letter, black-face laminated plastic engraving stock, Formica type ES-1, or City approved equal. Each shall be fastened securely, using fasteners of brass, cadmium plated steel, or stainless steel, screwed into inserts or tapped holes, as required. Engraved characters shall be block style of adequate size to be read easily at a distance of 6 feet with no characters smaller than 1/8-inch high.

B. Conductor and Equipment Identification: Conductor and equipment identification devices shall be either imprinted plastic-coated cloth marking devices such as manufactured by Brady, Thomas & Betts, or City approved equal, or shall be heat-shrink plastic tubing, imprinted split-sleeve markers cemented in place, or City approved equal.

C. Identification Tape: Identification tape for protection of buried electrical installation shall be a 6-inch wide red polyethylene tape imprinted "CAUTION - ELECTRIC UTILITIES BELOW."

2.11 LIGHTING AND POWER PANELBOARDS

A. General: Panelboards shall be dead front factory assembled. Panelboards shall comply with NEMA PB-1 as well as the provisions of UL 50 and 67. Panelboards used for service equipment shall be UL labeled for such use. Lighting panelboards shall be rated for 120/208-V 3-phase operation or 277/480-V 3-phase operation as shown.

1 Interiors shall have solderless, anti-turn connectors and shall be constructed so that branch circuit breaker can be replaced without disturbing adjacent units or resorting to field drilling and tapping. Bus bars and connecting drops shall be copper. Neutral bar shall be full-sized and shall have one terminal screw for each branch circuit; main bus bar shall be full-sized for entire length. Spaces shown shall have cross connections for the maximum sized device that can be fitted.

2 Panelboard box shall be galvanized code grade steel with knockouts, and shall have removable end walls. All boxes or panelboard enclosures shall have gray baked enamel finish.

B. Lighting Panelboards:

1 Cabinets for building panels shall be 20-inch wide minimum, with 4-inch minimum side gutters and 5-inch minimum top and bottom gutters. Panelboard trim shall be the same size as cabinet on surface-mounted panels and 3/4-inch larger all around than cabinet of flush-mounted panels. Doors in trim shall have typed circuit directory and pocket with protective clear plastic sheet. All trim and cabinets of surface-mounted panels in general

purpose areas shall be phosphate treated, primed and finished with baked enamel, panels of flush mounted panels shall be finished to match surrounding wall color.

2 The number of circuit breakers and the ampere ratings shall be in accordance with panel schedules. Main circuit breaker or main lugs only shall be provided as indicated. The panelboard circuit breakers shall be group mounted and shall be molded case with 3- or 2-pole main breakers as required and branch circuit breakers with 10,000 AIC for 208V panelboards and 14,000 AIC for 480V panelboards. Circuit breakers shall be thermal/magnetic type.

3 Surface mounted cabinets and trim in wet and damp areas shall be galvanized.

C. Panelboards shall be as manufactured by Square D, Cutler-Hammer, Siemens, or City approved equal.

2.12 PROCESS CONTROL DEVICES

A. Limit Switches:

1 Limit switches shall be of heavy-duty, precision type, and oil-tight assembly. Enclosures shall be NEMA 4X. Contact arrangement shall be double pole. Assembly shall be able to accommodate different type of head as required.

2 Limit switches shall be Square D Class 9007 Type C, or City approved equal.

B. Flow Switches: Flow switches shall be electronic type with single switch point circuitry and mounted in a UL-approved cast iron enclosure or an FM-approved cast aluminum enclosure. All wetted surfaces shall be Type 316 stainless steel. Power requirements shall be 120 VAC. Flow switches shall be FCI Model No. 12-64, or City approved equal.

2.13 CONTROL STATIONS

A. General: Control stations shall comply with NEMA Standards ICS2-216. All control stations shall be industrial type, heavy duty, oil-tight, with legend plates.

B. Requirements: Control stations shall be as follows:

1. Pushbutton Switch: Pushbutton switches shall be momentary type with round or square button plate. All emergency-stop pushbuttons shall have red button plates. Lock-out stop shall be momentary pushbutton with locking mechanism.

2. Selector Switches: Selector switches shall be rated 10 A at 600 V and shall be rotary type with number of position and poles as indicated.

3. Indicating Lights: Pilot lights shall be full-voltage, push to test type and with plastic color

caps: red color for running, green for ready, and amber for failure status.

4. Control station enclosures shall be NEMA 12 indoor and NEMA 4X SS outdoor.

C. Manufacturers: Manufacturers shall be Square D Class 9001, Allen-Bradley Bulletin 800, or City approved equal.

PART 3 -- EXECUTION

3.1 GROUNDING

A. General: Grounding cable shall be sized in accordance with NEC Article 250 requirements when sizes are not indicated on the Drawings. The location of ground rods shall be as indicated. The length of rods forming an individual ground array shall be equal in length and shall be of the quantity required to obtain a ground resistance of no more than 5 ohms.

B. Equipment Ground: Ground continuity throughout the facility shall be maintained by installing an electrically-continuous metallic raceway system, or a non-metallic raceway with a grounding conductor when non-metallic raceway is permitted in the Contract Documents.

1. Metallic raceway shall be installed with double lock nuts or hubs at enclosures. Nonmetallic raceway containing dc conductors operating at more than 50 V to ground, or any AC conductors, shall contain a copper grounding conductor either bare, or green if insulated. Such conductor shall be bonded to terminal and intermediate metallic enclosures.

2. Metal equipment platforms which support any electrical equipment shall be bonded to the nearest ground bus or to the nearest switchgear ground bus. This grounding requirement is in addition to the raceway grounding required in the preceding paragraph herein.

C. Grounding Electrode System: Install the grounding electrode system with all required components in accordance with NEC Article 250.

1. Connection to ground electrodes and ground conductors shall be exothermic welded where concealed and shall be bolted pressure type where exposed. Bolted connectors shall be assembled wrench-tight.
2. Insulated grounding bushings shall be employed for all grounding connections to steel conduits in switchboards, in motor control centers, in pullboxes, and elsewhere where conduits do not terminate at a hub or a sheet metal enclosure. Where insulated bushings are required, they shall be installed in addition to double lock-nuts.

3. Copper bonding jumpers shall be used to obtain a continuous metallic ground.

D. Shield Grounding:

1. Shielded power cable shall have its shield grounded at each termination in a manner recommended by the cable manufacturer.

2. Shielded instrumentation cable shall be grounded at one end only; this shall be at the Main Control Panel or otherwise at the "receiving" end of the signal carried by the cable, unless shop drawings indicate that the shield shall be grounded at both ends.

3. Termination of each shield drain wire shall be on its own terminal screw. All of these terminal screws in one rack shall be jumpered with No. 16 solid tinned bare copper wire; connection to ground shall be accomplished with a No. 12 green insulated conductor to the main ground bus.

3.2 UNDERGROUND DUCTS AND MANHOLES

A. Duct Bank Installation: The underground concrete encased duct bank shall be installed in accordance with the criteria below:

1. Duct shall be assembled using high impact nonmetallic spacers and saddles to provide conduits with vertical and horizontal separation. Plastic spacers shall be set every 5 feet.

2. The duct shall be laid on a grade line of at least 4 inches per 100 feet, sloping towards pullboxes or manholes. Duct shall be installed and pullbox and manhole depths adjusted so that the top of the concrete envelope is a minimum of 24 inches below grade.

3. Changes in direction of the duct envelope by more than 10 degrees horizontally or vertically shall be accomplished using bends with a minimum radius 24 times the duct diameter.

4. Couplings shall be staggered at least 6 inches vertically. Bottom of trench shall be of select backfill or sand. The duct array shall be anchored every 4 feet to prevent movement during placement of the concrete envelope.

5. Each bore of the completed duct bank shall be cleaned by drawing through it a standard flexible mandrel one foot long and 1/4-inch smaller than the nominal size of the duct through which the mandrel will be drawn. After passing of the mandrel, draw a wire brush and swab through.

6. A raceway, in the duct envelope, which does not require conductors, shall have a 1/8-inch polypropylene pull cord installed throughout the entire length of the raceway.

B. Duct Entrances: Duct entrances shall be grouted smooth; duct for primary and secondary cables shall be terminated with flush end bells. Sections of pre-fabricated manholes and pullboxes shall be assembled with waterproof mastic and shall be set on a 6-inch bed of gravel as recommended by the manufacturer or as required by field conditions.

C. Duct Bank Markers: Duct bank markers shall be installed every 200 feet along run of duct bank, at changes in horizontal direction of duct bank, and at ends of duct bank. Concrete markers, 6 by 6 inches square and one foot long, shall be set 2 inches above finish grade. The letter "D"

and arrow set in the concrete shall be facing in the direction of the duct alignment.

D. Wiring: Each duct bank shall contain a No. 4/0 bare stranded copper ground wire, continuous throughout the entire duct bank. End of ground wires shall be terminated at switchgear or MCC ground bus, or transformer ground lugs.

E. Watertight Penetrations: Duct bank penetration through walls of manholes or pullboxes, and on building walls below grade shall be watertight.

F. Trench Backfill: Trenches containing duct banks shall be filled with select backfill with no large rocks which could damage the duct.

G. Concrete Encased Duct Banks: Concrete encased duct bank shall terminate at building foundations. When duct enters the building on a concrete slab on grade, duct shall not be encased, but shall transition to rigid steel PVC-coated conduits on all stub-ups.

3.3 RACEWAYS

A. General: Raceways shall be installed as indicated, however, conduit routings shown are diagrammatic. Raceway systems shall be electrically and mechanically complete before conductors are installed. Bends and offsets shall be smooth and symmetrical, and shall be accomplished with tools designed for the purpose intended. Factory elbows shall be used for all 3/4-inch conduit. Bends in larger sizes of metallic conduit shall be accomplished by field bending or by the use of factory elbows. All installations shall be in accordance with the latest edition of the NEC.

B. Installation: Raceways shall be installed in accordance with the following schedule:

1. Low Voltage Raceway (control, power, and data hi-way and communications):

a. Rigid Schedule 40 PVC shall be used for concrete encased duct on earth.

b. PVC-coated galvanized rigid steel raceways shall be used on exposed locations in corrosive areas.

c. Galvanized rigid steel (GRS) shall be used on exposed installations in general purpose areas.

d. Electrical metallic (EMT) conduit shall be used in lighting and receptacle circuits on suspended ceilings or stud walls in general purpose areas.

e. Rigid Schedule 40 PVC shall be used for conduits embedded in concrete slab on grade and above grade.

f. Rigid Schedule 40 PVC shall be used for area lighting circuits and may not be concrete encased.

g. Schedule 40 PVC shall be used for fiber optic data hi-way system concrete encased on grade.

h. Galvanized rigid steel (GRS) conduit shall be used for coaxial data hi-way cables for concrete encased on grade and exposed installations.

i. Galvanized rigid steel shall be used in exposed installations in outdoor areas.

2. High Voltage Raceway:

a. Rigid Schedule 40 PVC conduits shall be used for concrete encased duct on earth.

b. Galvanized rigid steel conduits shall be used on exposed installations in general purpose areas.

c. PVC-coated rigid steel conduits shall be used on exposed installations in corrosive areas.

d. Galvanized rigid steel shall be used on exposed installations in outdoor areas.

3. Analog Signal Raceways:

a. Schedule 40 PVC conduits shall be used for concrete encased duct on earth.

b. PVC-coated GRS shall be used on exposed installations in corrosive areas.

c. Galvanized rigid steel conduits shall be used on exposed installations in general purpose areas.

d. Galvanized rigid steel shall be used on exposed installations in outdoor areas.

4. Exposed Raceways:

a. Conduits shall be rigidly supported with clamps, hangers, and Unistrut channels.
b. Intervals between supports shall be in accordance with the National Electric Code.

C. Conduit Terminations: Empty conduit terminations not in manholes or pullboxes shall be plugged. Exposed raceway shall be installed perpendicular or parallel to buildings except where otherwise indicated. Conduit shall be terminated with flush couplings at exposed concrete surfaces. Conduit stubbed up for floor-standing equipment shall be placed in accordance with approved shop drawings. Metallic raceways installed below-grade or in outdoor locations and in concrete shall be made up with a conductive waterproof compound applied to threaded joints. Compound shall be Zinc Clads Primer Coatings No. B69A45, HTL-4 by Crouse-Hinds, Kopr Shield by Thomas & Betts, or City approved equal.

D. Conduit Installations:

1. Conduit may be cast integral with horizontal and vertical concrete slabs, providing one-inch clearance is maintained between conduit surface and concrete surface. If said clearance cannot be maintained, the conduit shall be installed exposed below elevated slabs; provided, that in the case of slabs on grade, conduit shall be installed below the slab. Maximum size of conduit that can be cast in slab shall be 1-1/2 inches.

2. Nonmetallic conduit may be cast integral with horizontal slabs with placement criteria stated above. Non-metallic conduit may be run beneath structures or slabs on grade, without concrete encasement. In these instances conduit shall be placed at least 12 inches below the bottom of the structure or slab. Nonmetallic conduit may be buried 24 inches minimum below grade, with a 3-inch concrete cover, in open areas or where otherwise not protected by concrete slab or structures. Top of concrete cover shall be colored red. Nonmetallic conduit shall be permitted only as required by the Specifications and in concealed locations as described above.

3. Where a run of concealed PVC conduit becomes exposed, a transition to rigid steel conduit is required. Such transition shall be accomplished by means of a factory elbow or a minimum 3-foot length of rigid steel conduit, either terminating at the exposed concrete surface with a flush coupling. Piercing of concrete walls by nonmetallic runs shall be accomplished by means of a short steel nipple terminating with flush couplings.

4. Flexible conduit shall be used at dry locations for the connection of equipment such as motors, transformers, instruments, valves, or pressure switches subject to vibration or movement during normal operation or servicing. Flexible conduit may be used in lengths required for the connection of recessed lighting fixtures; otherwise the maximum length of flexible conduit shall be 18 inches.

5. In other than dry locations, connections shall be made using flexible liquid-tight conduit. Equipment subject to vibration or movement which is normally provided with wiring leads, such as solenoid valves, shall be installed with a cast junction box for the make-up of connections. Flexible conduits shall be as manufactured by American Brass, Cablec, Electroflex, or City approved equal.

6. Conduit penetrations on walls and concrete structures shall be performed in accordance with the following:

    a. Seal all raceways entering structures at the first box or outlet with oakum or suitable plastic expandable compound to prevent the entrance into the structure of gases, liquids, or rodents.

    b. Dry pack with nonshrink grout around raceways that penetrate concrete walls, floors, or ceilings aboveground, or use one of the methods indicated for underground penetrations.

    c. Where an underground conduit enters a structure through a concrete roof or a membrane waterproofed wall or floor, provide an acceptable, malleable iron, watertight, entrance sealing device. When there is no raceway concrete encasement, provide such device having a gland type sealing assembly at each end

with pressure bushings which may be tightened at any time. When there is raceway concrete encasement indicated, provide such a device with a gland type sealing assembly on the accessible side. Securely anchor all such devices into the masonry construction with one or more integral flanges. Secure membrane waterproofing to such devices in a permanently watertight manner.

d. Where an underground raceway without concrete encasement enters a structure through a non-waterproofed wall or floor, install a sleeve made of Schedule 40 galvanized pipe. Fill the space between the conduit and sleeve with a suitable plastic expandable compound, or an oakum and lead joint, on each side of the wall or floor in such a manner as to prevent entrance of moisture. A watertight entrance sealing device may be used in lieu of the sleeve.

3.4 WIRES AND CABLES

A. General: Conductors shall not be pulled into raceway until:

1. Raceway system has been inspected and accepted by the Resident Engineer.
2. Plastering and concrete have been completed in affected areas.
3. Raceway system has been freed of moisture and debris.

B. Wire and Cables:

1. Conductors of No. 1 size and smaller shall be hand pulled. Larger conductors may be installed using power winches. Pulling tensions on the cables shall be within the limits recommended by the cable manufacturer. Wire pulling lubricant, where needed, shall be UL approved.

2. Wire in panels, cabinets, and gutters shall be neatly grouped using nylon tie straps, and shall be fanned out to terminals.

3. Cables rated 2000 V and above shall be fireproofed for their entire exposed length in manholes and handholes, using 1-1/2-inch arc-proofing tape anchored by overwrapping with glass cloth tape such as 3M Co. No. 27, Scotch, Plymouth, or City approved equal.

C. Splices and Terminations:

1. The Contractor shall provide, install, and terminate the conductors required for power and controls to electrical equipment and to interconnect incoming annunciator, instrumentation terminal cabinets, control and instrumentation equipment except where indicated elsewhere. There shall be no cable splices in underground manhole or pullboxes. If splices are necessary, the cables shall be brought aboveground and terminated in a NEMA 4X, stainless steel terminal or splice cabinet on a concrete pad.
2. Two- and three-conductor shielded cables installed in conduit runs which exceed 2000 feet may be spliced in pullboxes. These cable runs shall have only one splice per conductor.

3. Control conductors shall be spliced or terminated only at the locations indicated and only on terminal strips or terminal lugs of vendor furnished equipment. For the purposes of Division 16, "control conductors" are defined as conductors operating at 120 V or less in circuits that indicate equipment status or that control the electric energy delivered to a power consuming device.

4. All 120/208-V and 480-V branch circuit conductors may be spliced in suitable fittings at locations determined by the Contractor. All cables rated above 2000 V shall be spliced or terminated only at equipment terminals shown.

5. Solid conductors shall be terminated at equipment terminal screws with proper care that conductor is tightly wound around screw and does not protrude beyond screw head. Stranded conductors shall be terminated directly on equipment box lugs making sure that all conductor strands are confined within lug. Use forked-tongue lugs where equipment box lugs have not been provided.

6. Splices in 600-V wire which are not pre-insulated shall be insulated with three layers of tape each half lapped except that splices in below grade pull boxes or in any box subject to flooding shall be made watertight using an epoxy resin splicing kit.

7. Splices to motor leads in motor terminal boxes shall be wrapped with mastic material to form a mold and then shall be taped with a minimum of two layers of varnished cambric tape overtaped with a minimum of two layers of high temperature tape.

8. Shielded power cable shall be terminated with pre-assembled stress cones in a manner approved by the cable manufacturer. Submit the proposed termination procedure as described for shop drawings.

9. Control devices, such as solenoid operated valves, that are normally supplied with conductor pigtails, shall be terminated as described for control conductors.

D. Cable Assembly and Testing: Cable assembly and testing shall comply with applicable requirements ICEA Publication No. S-68-516 and other relevant ICEA publications. Factory test results shall be submitted in accordance with Section 01300 - Submittals, prior to shipment of cable. The following tests shall be the minimum requirements:

1. High potential DC test shall be performed on all cables operating at more than 2000 V to ground.

2. Insulation resistance shall be obtained and shall not be less than the value recommended by ICEA.

3. All cables rated at 600 V shall be tested for insulation resistance between phases and from each Phase to a ground using a megohmeter.

4. All field testing mentioned above shall be done after cables are installed in the raceways.

5. Field tests shall be performed by certified test organization acceptable to the cable manufacturer. Test results shall be submitted for review and acceptance.

6. Cables failing in the said tests shall be replaced with a new cable or repaired. Such kind of repair methods shall be as recommended by the cable manufacturer and shall be performed by persons certified by the industry.

E. Continuity Test: All control and instrumentation cables shall be tested for continuity, polarity, undesirable ground, and origination. Such tests shall be performed prior to placing all cables in service.

3.5 PULL AND JUNCTION BOXES

A. Sizing: Pull and junction boxes shall be sized in accordance with the requirements of the NEC.

B. Outlet Boxes: Outlet boxes shall be used as junction boxes wherever possible. Where separate pullboxes are required, they shall have screw covers.

C. Requirements: Pullboxes shall be installed when conduit run contains more than three 90-degree bends and runs exceed 200 feet.

3.6 LIGHTING AND POWER DISTRIBUTION PANEL BOARDS

A. The circuit description as indicated on the Record Drawings or Panel Schedule shall be typed on the circuit directory.

B. Panel boards shall be tested for proper operation and function.

3.7 CABINETS AND ENCLOSURES

A. Cabinets shall be set plumb at an elevation that will cause the maximum circuit breaker height to be less than 66 inches. Top edge of trim of adjacent panels shall be at the same height. Panels which are indicated as flush mounted shall be set so cabinet is flushed and serves as a "ground" for plaster application.

B. All factory wire connections shall be made at shipping splits, and all field wiring and grounding connections shall be made after the assemblies are anchored.

3.8 CONCRETE HOUSEKEEPING

A. Housekeeping Pads: Concrete housekeeping pads shall be provided for all floor standing electrical equipment.

B. Housekeeping Curbs: Concrete housekeeping curb shall be provided for all conduit stub-up in

indoor and outdoor locations, not concealed by equipment enclosures. Such curb shall be 3 inches above finished floor or grade.

3.9 EQUIPMENT ANCHORING

A. Anchors: Freestanding or wall-hung equipment shall be anchored in place by methods that will meet seismic requirement in the area where project is located. Wall-mounted panels that weigh more than 500 pounds or which are within 18 inches of the floor shall be provided with fabricated steel support pedestal(s). Pedestals shall be of welded steel angle sections. If the supported equipment is a panel or cabinet and enclosed with removable side plates, it shall match supported equipment in physical appearance and dimensions. Transformers hung from 4-inch stud walls and weighing more than 300 pounds, shall have auxiliary floor supports.

B. Leveling Channels: Leveling channels anchored to the concrete pad shall be provided for all switchgear and pad-mounted transformer installations.

C. Anchoring Methods: Anchoring methods and leveling criteria specified in the printed recommendations of the equipment manufacturers are a part of the Work of this Contract. Such recommendations shall be submitted as required for shop drawings in Section 01300 - Submittals.

3.10 CABLE AND EQUIPMENT IDENTIFICATION

A. General: The completed electrical installation shall be provided with adequate identification to facilitate proper control of circuits and equipment and to reduce maintenance effort.

B. Cable: Assign each control and instrumentation wire and cable a unique identification number. Said numbers shall be assigned to all conductors having common terminals and shall be shown on all shop drawings. Identification numbers shall appear within 3 inches of conductor terminals. "Control" shall be defined as any conductor used for alarm, annunciator, or signal purposes:

1. Multiconductor cable shall be assigned a number which shall be attached to the cable at intermediate pull boxes and at stub-up locations beneath free-standing equipment. It is expected that the cable number shall form a part of the individual wire number. All individual control conductors and instrumentation cable shall be identified at pull points as described above. The instrumentation cable numbers shall incorporate the loop numbers indicated on the Drawings.

2. All 120/208-V system feeder cables and branch circuit conductors shall be color coded as follows: Phase A-black, Phase B-red, Phase C-blue, and Neutral-white. The 480/277-V system conductors shall be color coded as follows: Phase A-brown, Phase B- orange, Phase C-yellow, and Neutral-gray. Color coding tape shall be used where colored insulation is not available. Branch circuit switch shall be yellow. Insulated ground wire shall be green, and neutral shall be gray. Color coding and phasing shall be consistent throughout the site, but bars at panelboards, switchboards, and motor control centers shall be connected Phase A-B-C, top to bottom, or left to right, facing connecting lugs.

3. General purpose ac control cables shall be pink. General purpose dc control cables shall be blue.

4. All spare cables shall be terminated on terminal screws and shall be identified with a unique number as well as with destination.

5. Terminal strips shall be identified by imprinted, varnished, marker strips attached under the terminal strip.

C. Equipment: Equipment and devices shall be identified as follows:

1. Nameplates shall be provided for all panelboards, panels, starters, switches, and pushbutton stations. In addition to the name plates shown, control devices shall be equipped with standard collar-type legend plates.

2. Control devices within enclosures shall be identified similar to the paragraph above.

3. Three-phase receptacles shall be consistent with respect to phase connection of receptacle terminals. Errors in phasing shall be corrected at the bus, not at the receptacle.

4. Toggle switches which control loads out of sight of switch, and all multiswitch locations of more than two switches, shall have suitable inscribed finish plates.

5. Empty conduits shall be tagged at both ends to indicate the destination at the far end. Where it is not possible to tag the conduit, destination shall be identified by marking an adjacent surface.

6. Provide typewritten circuit directories for panelboards; circuit directory shall accurately reflect the outlets connected to each circuit.

7. Install identification tape directly above buried unprotected raceway; install tape 8 inches below grade and parallel with raceway to be protected. Identification tape is required for all buried raceway not under buildings or equipment pads except identification tape is not required for protection of street lighting raceway.

END OF SECTION

SECTION 16070
VIBRATION AND SEISMIC CONTROLS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

The intent of this Section is to provide for adequate resistance to forces induced by earthquakes for electrical components and systems so as to preclude injury or impeded egress of personnel.

1.1 SECTION INCLUDES

A. Provide and install, hangers, supports, anchors, concrete bases, and other positive fastenings for electrical nonstructural components for which designed anchors are shown on the Drawings, such that in-service loads and seismic forces are safely transferred to the structure and relative seismic displacements of supporting structures are adequately accommodated.

B. Provide vibration isolation for electrical components as specified in this Section or indicated on the Drawings.

1.2 NON-SEISMIC HANGERS AND SUPPORTS

A. Follow Section 16070 – Hangers and Supports for Electrical Systems for hangers and supports for electrical components not identified on the Drawings as requiring vibration isolators or seismic designed anchors or braces.

1.3 QUALITY ASSURANCE

A. Furnish and install hangers and supports that conform to the requirements of the following codes and standards:

1. NFPA 70, National Electric Code (NEC)
2. IBC, International Building Code
3. ASCE 7, Minimum Design Loads for Buildings and Other Structures
4. NECA 1, Standard Practices for Good Workmanship in Electrical Contracting
5. Metal Framing Manufacturers Association
    a. MFMA-4, Metal Framing Standards Publication
    b. MFMA-102, Guidelines for the Use of Metal Framing

B. Where a Nationally Recognized Testing Laboratory (NRTL) has requirements for such products, provide products that are NRTL listed and labeled for the application, installation condition, and the environment in which installed.

1.4 ACTION/INFORMATIONAL SUBMITTALS

A. Catalog Data: Submit catalog data for each type of product specified. Include information substantiating equivalent corrosion resistance to zinc coated steel of alternative treatment, finish, or inherent material characteristic.

B. Material List: Submit schedule showing manufacturer's figure number, size, spacing, features, and application for each required type of hanger, support, sleeve, seal, vibration isolator, and fastener to be used.

C. Test reports:

1. Pre-set Concrete Anchors: Submit either of the following:

a. ICC Evaluation Service, Inc (ICC-ES) evaluation report stating that the product is compliant with the current edition of the IBC and the intended conditions of use.

b. Drawing showing use as an approved component a in fixed equipment anchorage design that have been approved by an agency such as the State of California Office of Statewide Health Planning and Development.

2. Vibration Isolators: Submit either of the following:

a. ICC Evaluation Service, Inc (ICC-ES) evaluation report stating that the product is compliant with the current edition of the IBC and the intended conditions of use.

b. Drawing showing use as an approved component a in fixed equipment anchorage design that have been approved by an agency such as the State of California Office of Statewide Health Planning and Development.

D. Shop Drawings: Submit shop drawings showing details of fabricated hangers, vibration isolators, supports, and seismic control of the electrical nonstructural components listed below. Provide detail drawings along with catalog cuts, templates, and erection and installation details, as appropriate, for the components listed below. Submittals shall be complete in detail; shall indicate thickness, type, grade, class of metal, and dimensions; and shall show construction details, reinforcement, anchorage, and installation with relation to the building construction.

1. Transformers

2. Motor Starters

E. Component Certifications: Submit certification from the manufacturer / supplier that the following items furnished under this Subcontract will be able to a) maintain containment of hazardous content, and / or b) remain operable following the design seismic event. Certification shall be in accordance with the Project's Statement of Special Inspections document.

1. Transformers T-1, T-2

2. Switchboard MSB-1, SE1

3. Panelboards H-1, L-1

4. Enclosed circuit breakers and safety switches DS-1 through DS-6

5. Soft Start Motor Starters SS-1, SS-2, SS-3

6. Variable frequency motor controllers VFD-1, VFD-2, VFD-3

7. Engine-generator

1.5 RECEIVING, STORING AND PROTECTING

A. Receive, store, and protect, and handle products according to NECA 1.

PART 2 PRODUCTS

2.1 SUBSTITUTIONS

A. Alternate products may be accepted; follow requirements of Standard Specifications for Public Works Construction ("Whitebook"), 2015 edition.

B. Substitutions are permitted unless noted otherwise; however, "City approved equal" seismically controlled nonstructural components must be reviewed and approved by the design structural-engineer-of-record.

2.2 COATINGS AND MATERIALS

A. Furnish products for use indoors that are protected with zinc coating or with treatment of equivalent corrosion resistance using approved alternative treatment, finish, or inherent material characteristic.

B. Furnish products for use outdoors or in damp or corrosive indoor locations with hot-dip galvanized coating or with treatment of equivalent corrosion resistance using approved alternative treatment, finish, or inherent material characteristic.

2.3 BOLTS

A. Furnish bolts, anchor rods, washers, and nuts as specified in Section 05990 Structural and Miscellaneous Metals.

2.4 PRE-SET CONCRETE INSERTS

A. Furnish pre-set concrete inserts as shown on the Drawings and specified below.

B. Permissible uses and allowable load capabilities of pre-set concrete inserts shall be documented in either of the following two ways:

1. Have an ICC-ES evaluation report stating that the product is compliant with the current edition of the IBC and the intended conditions of use.

2. Be shown as approved components in fixed equipment anchorage designs that have been approved by an agency such as the State of California Office of Statewide Health Planning and Development.

C. Manufacturers:

1. Continuous inserts for wood forms: B-Line "B22I-12" or longer.

2. Spot inserts for wood forms or metal decks: B-Line "B2500" with "N2500" nut, "B2501"

2.5 POST-INSTALLED CONCRETE ANCHORS

A. Furnish post-installed expansion, adhesive, and undercut concrete and masonry anchors as shown on the Drawings and Section 05550 Anchorage in Concrete and Masonry.

2.6 BEAM CLAMPS:

A. Furnish beam clamps that are NRTL-listed and compliant with Federal Specification WW-H-171E Type 23 or Manufacturers' Standardization Society SP-69 and SP-58 Type 23.

B. Provide beam clamps with a locknut on the setscrew.

C. Provide NRTL-listed restraining strap for each beam clamp. Strap shall be not less than 16 gauge thickness, not less than 1 inch wide, and of sufficient length to wrap around the beam flange not less than 1 inch.

2.7 HANGER RODS

A. Furnish mild steel rods that conform to ASTM A 307, *Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength.*

B. Furnish rods that are threaded on both ends, threaded on one end, or continuous threaded with UNC (coarse) thread pitch.

2.8 SWAY BRACING MATERIALS

A. Furnish sway bracing materials (e.g. rods, plates, cable, angles) as shown on the Drawings and specified in Section 05990 Structural and Miscellaneous Metals.

2.9 FRAMING CHANNEL SYSTEMS

A. Furnish U-channel framing systems that conform to MFMA-4 and are fabricated using minimum 12-gage steel, with 9/16 inch diameter holes, from 1-1/2 to 1-7/8 inches on center, in the surface opposite the "U" opening.

B. Furnish fittings and accessories that mate and match with U-channel and are of the same manufacturer. Use two-piece, single bolt type conduit straps on U-channel supports.

C. Manufacturers: Unistrut, B-Line, Superstrut.

2.10 REINFORCED CONCRETE

A. Refer to Section 03200, Concrete Reinforcement.

B. Furnish housekeeping pad anchors to connect concrete bases to the structural floor.

1. Material: ductile iron.
2. Anchorage to concrete base: two #3 reinforcing bars
3. Anchorage to structural floor: post-installed stud-type anchor as specified in Section 05550 Anchorage in Concrete and Masonry.
4. Manufacturer: Mason Industries "HPA"

2.11 VIBRATION ISOLATORS

A. Furnish vibration isolators as described below and indicated on the Drawings.

B. Permissible uses and allowable load capabilities of vibration isolators shall be documented in either of the following two ways:

1. Have an ICC-ES evaluation report stating that the product is compliant with the current edition of the IBC and the intended conditions of use.

2. Be shown as approved components in fixed equipment anchorage designs that have been approved by an agency such as the State of California Office of Statewide Health Planning and Development.

C. Floor Mounted Elastomeric Vibration Isolator Mountings:

1. Furnish captive elastomeric mounting molded from neoprene or EPDM compound meeting the requirements of ASTM D200. Load bearing elastomer mount shall be housed in steel or cast ductile iron housing.

2. Mounting shall incorporate a fail-safe captive design, and shall be capable of providing vertical compression dynamic deflections from approximately 0.15 inches to 0.3 inches at rated capacity.

3. Manufacturer: Mason Industries, Inc. "RBA", "RCA", "RDA", "BR"

D. Floor Mounted Spring Vibration Isolator Mountings:

1. Furnish seismic steel spring isolator mountings that have elastomeric snubbing in all directions.

2. Springs shall be color coded using polyester epoxy powder coat to indicate rated load capacity. Spring diameter shall be not less than 0.8 times the compressed height of the spring at rated load. Springs shall have a minimum additional travel to solid not less than 50 percent of the rated deflection.

3. Snubber shall be adjustable in the vertical direction to allow a maximum of 0.25 inch travel before contacting the elastomer cushion.

4. Housing shall be cast ductile iron, malleable cast iron, or welded steel construction; grey iron castings are not acceptable. Housings shall include provision to adjust the rebound plate and to inspect the spring(s).

5. Hardware shall be stainless steel or zinc coated.

6. Manufacturer: Mason Industries, Inc. "SLR", "SLREBP", "SLRS", "SLRSEBP", "SSLFH"

E. Combination Spring / Rubber Vibration Isolator Hangers:

1. Furnish combination spring / rubber vibration isolator hangers consisting of a steel compression spring in series with compression elastomer elements with elastomeric snubbing in all directions.

2. Springs shall be color coded to indicate rated load capacity and shall have a minimum additional travel to solid not less than 50 percent of the rated deflection.

3. Snubber shall be adjustable in the vertical direction to allow a maximum of 0.25 inch travel before contacting the elastomer cushion.

4. Manufacturer: Mason Industries, Inc. "PC30N"

PART 3 EXECUTION

3.1 GENERAL

A. Refer to Section 05990 Structural and Miscellaneous Metals for general seismic protection installation requirements.

B. Install hangers, supports, vibration isolation, and seismic control according to the Drawings, the requirements in this Section, and the requirements of the applicable codes. Where overlap exists, the more stringent of the requirements will govern.

C. Conform to manufacturer's instructions and recommendations for installation of hangers, supports, anchors, seismic controls, and vibration isolators.

D. Do not use wire or perforated strap for permanent electrical supports.

E. Anchor each item of electrical equipment as shown on the Drawings.

F. Refer to Section 16491 Interior Lighting for installation requirements for interior luminaires.

3.2 EXAMINATION

A. Examine surfaces to receive hangers, supports, and seismic control for compliance with installation tolerances and other conditions affecting performance of the system. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.3 SEISMIC RELATIVE DISPLACEMENTS

A. Furnish and install flexible joints, fittings, or hangers capable of accommodating 2 inches of seismic relative displacement for vertical conduits larger than 2-1/2" trade size, cable trays, busways, etc. attached at different levels or stories of the building.

B. Furnish and install flexible joints, fittings, or hangers capable of accommodating 2 inches of seismic relative displacement for horizontal conduits larger than 2-1/2" trade size, cable trays, busways, etc. attached on either side of a building seismic or expansion joint.

C. Furnish and install flexible joints, fittings, or hangers capable of accommodating 2 inches of seismic relative displacement for horizontal conduits larger than 2-1/2" trade size, cable trays, busways, etc. attached to separate structures.

3.4 SLEEVES AND SEALS

A. Furnish and install and install sleeves in concrete slabs and walls and all other fire- rated floors and walls for installation of conduits, cable trays, wireways, busways, etc.

B. Furnish and install sleeves through fire-rated walls or floor construction. Follow manufacturer's instructions to restore original fire rating of wall or slab.

C. Size sleeves in interior non-fire-rated walls as indicated on the Drawings or as required to provide clearances that will permit differential movement of conduits,

D. Furnish seals for electrical conduit penetrations of slabs on grade and exterior walls below grade and where indicated. Tighten sleeve seal screws until sealing grommets have expanded to form watertight seal.

E. Request inspection of firestop installations through the Resident Engineer both before and after installation of firestop materials.

3.5 SPREADERS

A. Install spreaders between adjacent runs of conduits, cable trays, wireways, busways, fire sprinkler pipes, plumbing pipes, etc. as shown on the Drawings.

3.6 SWAY BRACES

A. Transverse Sway Bracing

1. Install transverse sway bracing for conduits, cable trays, wireways, busways, etc as shown on the Drawings.

B. Longitudinal Sway Bracing

1. Install longitudinal sway bracing for conduits, cable trays, wireways, busways, etc. as shown on the Drawings.

C. Vertical Runs

1. Run is defined as length of conduit, cable tray, wireway, busway, etc. between end joints.

2. Install sway bracing for vertical runs of conduit, cable tray, wireway, busway, etc. as shown on the Drawings.

D. Anchor Rods, Angles and Bars

1. Bolt anchor rods, angles, and bars to either electrical component clamps hangers at one end and to cast-in-place concrete or masonry insert, or clip angles bolted to the steel structure, on the other end.

2. Furnish bolts for attachment of anchors as shown.

3. Rods shall be solid metal or pipe.

3.7 CONCRETE BASES

A. Install a reinforced concrete base for each item of floor- mounted electrical equipment.

1. Construct bases as dimensioned and detailed on the Drawings.
2. Make bases not less than 5 inches thick.
3. Make bases level to within 1/8 inch per 3-foot distance in any direction.

B. Anchor each concrete base to the structural floor.

1. Install housekeeping pad anchors in accordance with the manufacturer's instructions.
2. Attach housekeeping pad anchors to the structural floor using post installed concrete anchors as shown on the Drawings.
3. Attach housekeeping pad anchors to the concrete base reinforcing steel using two #3 reinforcing bars per anchor.

C. Support each engine generator on a reinforced concrete equipment base with a permanent steel perimeter frame.

1. Form base using ASTM A-36 steel channels.
2. Construct base not less than 4 inches larger in both directions than supported equipment. Miter and weld corners and provide cross bracing.
3. Install reinforcing as shown on the Drawings. Refer to 03200, Concrete Reinforcement.
4. Place pre-set anchors, conduits, and sleeves using the equipment manufacturer's installation template or instructions. Install post-installed anchors in accordance with post-installed concrete anchors article below.
5. Place concrete and provide a level, steel trowel finish on top. Refer to 03200, Concrete Reinforcement.
6. Clean exposed steel frames and apply 2 coats of rust preventative metal primer and 2 coats of gray exterior, gloss, alkyd enamel.

D. Support each switchboard and Automatic Transfer Switch on a formed concrete equipment base.

1. Form concrete equipment bases using framing lumber with form release compounds. Refer to 03200, Concrete Reinforcement.
2. Construct concrete base not less than 4 inches larger in both directions than supported unit.
3. Install reinforcing as shown on the Drawings. Refer to 03200, Concrete Reinforcement.

4. Place pre-set anchors, conduits, and sleeves using the equipment manufacturer's installation template or instructions. Install post-installed anchors in accordance with post-installed concrete anchors article below.

5. Place concrete and provide a level, steel trowel finish on top; chamfer top edges and corners. Refer to 03200, Concrete Reinforcement.

E. Cure concrete not less than seven days before installing equipment.

3.8 PRE-SET CONCRETE INSERTS

A. Install pre-set concrete inserts as shown on the Drawings and in accordance with the manufacturer's instructions.

B. Schedule and coordinate placement of pre-set concrete inserts with the work of other trades.

3.9 POST-INSTALLED CONCRETE ANCHORS

A. Install post-installed concrete and masonry anchors as shown on the Drawings and in accordance with Section 05550 Anchorage in Concrete and Masonry. Test as specified therein.

3.10 FASTENING

A. Use beam clamps for fastening to structural metal beams, joists, and purlins.

1. Install a restraining strap at each beam clamp. Wrap the restraining strap around the beam flange not less than 1 inch. Where purlins or beams do not provide a secure lip for the restraining strap, secure the strap with a self-tapping screw or by through-bolting.

2. Use a locknut on each beam clamp set screw.

B. Use self-tapping screws or machine bolts, nuts, and washers for fastening to metal studs or metal surfaces.

C. Torque threaded fasteners as recommended by the manufacturer's instructions.

3.11 FRAMING CHANNEL SYSTEMS

A. Install framing channel systems as detailed on the Drawings and in accordance with MFMA-103.

3.12 VIBRATION ISOLATION

A. Install and adjust vibration isolators in accordance with the manufacturer's installation instructions.

B. Make flexible electrical connections to equipment supported by vibration isolators.

3.13 HANGER RODS

A. Use minimum 3/8-inch diameter threaded rod; use larger diameter rod as indicated on the Drawings, in other Sections, or in the supported equipment manufacturer's installation instructions.

B. Install a locknut at every hanger rod connection.

3.14 PAINTING

A. Paint exposed hangers and supports to match finish of adjacent surfaces.

B. Refer to Section 09900, Painting and Coating for materials and installation requirements.

END OF SECTION

SECTION 16140
WIRING DEVICES

PART 1 GENERAL

1.1 SUMMARY

A. SECTION INCLUDES

1. Receptacles
2. Snap switches
3. Wall plates
4. Multi-outlet assemblies
5. Occupancy sensing lighting controls

1.2 SUBMITTALS

A. Submit the following:

1. Catalog Data
2. Wiring Diagrams

1.3 QUALITY ASSURANCE

A. Comply with the *National Electrical Code* (NEC).

B. Furnish products listed and labeled by a nationally recognized testing laboratory (NRTL) for the application, installation condition, and the environments in which installed.

C. Manufacturers of products addressed in this Section shall maintain an ISO 9001 or ISO 9002 certification.

1.4 RECEIVING, STORING, AND PROTECTING

A. Receive, store, and protect, and handle products according to NECA 1, *Standard Practices for Good Workmanship in Electrical Construction.*

1.5 COORDINATION

A. Coordinate with other work, including painting, electrical boxes and wiring installations, to interface installation of wiring devices with other work.

B. Field locations of walls, partitions, doors, windows and equipment may vary from locations shown on the Drawings. Prior to locating sleeves, boxes and chases for roughing-in of conduit and equipment, coordinate with other trades to determine exact field location of the above items. Verify direction of door swings so that local switches are properly located on the strike side of the doorway.

C. Coordinate wiring device colors with Architect.

D. Coordinate receptacle requirements for items of equipment provided to the Project under other sections of this Specification or by the City.

PART 2 PRODUCTS

2.1 PRODUCT OPTIONS AND SUBSTITUTIONS

A. Alternate products may be accepted; follow requirements of *Standard Specifications for Public Works Construction* ("Whitebook"), 2015 edition.

2.2 RECEPTACLES

A. Provide back and side wired, screw pressure terminal, straight-blade and locking type, receptacles as indicated on the drawings.

1. Receptacles shall meet the performance and design requirements of Federal Specification WC596 and UL Standard 498, *Electrical Attachment Plugs and Receptacles.*

2. Receptacle configurations shall be in accordance with NEMA WD 6.

3. Catalog numbers in this article do not indicate receptacle color; see FINISHES article below.

B. Where indicated on the Drawings for special-purpose 120 volt duplex receptacles connected to 20 amperes branch circuits, provide straight-blade NEMA 5-20R, 20 amperes, 125 volts, grounding duplex receptacles. Receptacle mounting strap, ground terminal, and ground contacts shall be formed from one piece of brass alloy. Manufacturer: Hubbell "HBL5362".

C. For 120 volt receptacles connected to individual 20 amperes branch circuits provide straight-blade NEMA 5-20R, 20 amperes, 125 volts, grounding single receptacles. Receptacle mounting strap, ground terminal, and ground contact shall be formed from one piece of brass alloy. Manufacturer: Hubbell "HBL5361".

D. For ground fault circuit interrupter (GFCI) receptacles provide straight-blade NEMA 5-15R, 15 amperes, 125 volts, grounding, "feed through" type, self-testing GFCI, weather-resistant, duplex receptacle that meet the requirements of UL Standard 943, *Ground Fault Circuit Interrupters*. Provide units that can be installed in a 2-3/4-inch deep outlet box without an adapter. Manufacturer: Hubbell "GFR5262SG."

E. Provide straight-blade and twist lock receptacles for special applications as indicated on the Drawings.

F. Where items of equipment are provided to the Project under other sections of this specification or by the City, provide a compatible receptacle for the cap or plug and cord of the equipment.

G. Provide a back box suitable for each particular receptacle device and installation location.

H. Where indicated on the Drawings provide 20, 30, 60, and 100 ampere pin and sleeve receptacles with safety interlocks that will prevent making or breaking the receptacle connection under load.

I. For each receptacle provide a matching plug.

J. Manufacturer: Pass & Seymour "IEC 309 Industrial Products"

K. Provide external cable grips of the woven wire mesh type made of high-strength galvanized-steel wire strands, matched to cable diameter and with attachment provision designed for the corresponding connector.

2.3 SNAP SWITCHES

A. Provide single pole, double pole, three-way, four-way and illuminated handle snap switches as indicated on the Drawings.

B. Switches shall be rated 20 amperes, 120-277 volts AC, back and side wired, screw pressure terminal, quiet type AC switch with yoke grounding screw. Switches shall meet the performance and design requirements of UL Standard 20, *General Use Snap Switches*, and Federal Specification WS896.

C. Catalog numbers in this article do not indicate receptacle color; see FINISHES article below.

D. Manufacturer: Pass & Seymour, Hubbell, or City approved equal.

2.4 WALL PLATES

A. For flush mounted interior receptacles and wall switches, provide 0.032 inch thick (minimum) brushed 302/304 alloy stainless steel smooth wall plates that meet the requirements of Federal Specification WP-455A. Manufacturer: Hubbell "S" series.

B. For surface mounted interior receptacles and switches, furnish galvanized steel 4 inch square raised surface covers. Receptacles installed in raised covers shall be secured by more than one screw. Manufacturer: RACO "800" series.

C. For GFCI receptacles in damp locations provide weatherproof, cast aluminum, hinged, self-closing device covers. Manufacturer: Hubbell "WP26" or "WPFS26"

D. For GFCI receptacles in wet locations provide cast aluminum, hinged, "extra duty" self-closing device covers that are weatherproof whether or not the attachment plug cap is inserted. Manufacturer: Hubbell "WP826" or "WP826H"

E. Use metal plate-securing screws to match plate finish.

F. Provide single, multi-gang, and combination type wall plates that mate and match with corresponding wiring devices.

2.5 MULTIOUTLET ASSEMBLY

A. Furnish multi-outlet assembly that meets the requirements of UL5 - *Surface Metal Electrical Raceways and Fittings*, and the NEC.

B. Components of assemblies shall be products of a single manufacturer designed to be used together to provide a complete matching assembly of raceways and receptacles.

C. Nominal dimensions of the assembled raceway shall be 1-1/4 inches wide by 3/4 inch high.

D. Furnish fittings required for a complete installation.

E. No. 12 AWG THHN insulated conductors and a green THHN insulated No. 12 AWG ground wire.

2.6 OCCUPANCY-SENSING LIGHT SWITCHES

A. Provide an NRTL-listed, ceiling-mount combination passive-infrared/ultrasonic automatic sensor with built-in light level sensor, adjustable time delay, and adjustable sensitivity. Provide universal voltage power pack to derive operating voltage for sensor and to switch 20 amperes of ballast-type lighting load; power pack shall be suitable for use in air-handling plenums. Where indicated on the Drawings provide auxiliary relay pack for daylighting control. Manufacturer: Cooper, Hubbell or WattStopper "DT-300-U" with "BZ-U" series power pack.

B. Catalog numbers in this article do not indicate device color; see FINISHES article below.

2.7 FINISHES

A. Wiring device catalog numbers do not designate device color. Provide devices with colors as follows:

1. Wiring devices connected to normal power system: Ivory or other device color as selected by Architect or Interior Designer, unless otherwise indicated or required by the NEC.

2. TVSS devices: Surge symbol on ivory or other device color as selected by Architect or Interior Designer.

B. For renovation or expansion of existing facilities, provide devices and plates to match existing, remaining devices and plates.

PART 3 EXECUTION

3.1 PREPARATION

A. Verify outlet boxes are installed at proper locations and heights.

B. Verify that outlet boxes in walls or ceilings are positioned in accordance with NEC Section 314.20.

C. Verify that outlet boxes for GFCI receptacle outlets are in locations that will be accessible after City-supplied equipment is in place.

D. Verify wall openings are neatly cut, comply with NEC Section 314.21, and will be completely covered by wall plates.

E. Verify branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.

F. Clean debris from outlet boxes before installing devices.

3.2 INSTALLATION

A. Install products following manufacturer's instructions. Have the manufacturer's installation instructions available at the construction site.

B. Install devices plumb, level, and secure.

C. Except as otherwise indicated on the Drawings, mount devices flush, with long dimension vertical, and grounding point of receptacles on top. Group adjacent switches and receptacles under single, multi-gang wall plates.

D. Do not use the duplex/split-wire break-off tabs in receptacles as circuit conductors for connecting downstream devices.

E. Cover devices and assemblies during painting.

F. Install wall plates on switch, receptacle, and blank outlets after painting is complete.

G. Install galvanized steel plates on outlet boxes and junction boxes in unfinished areas, above accessible ceilings, and on surface mounted outlets.

H. Install Class 2 wiring for occupancy-sensing lighting/receptacle control system in accordance with NEC Article 725.

I. Install a grounded conductor (neutral) to each switch/controller wall box for each controlled circuit.

J. Connect the designated neutral terminal/wire on an electronic lighting control device to the grounded (neutral) conductor for the controlled circuit. Do not use the equipment grounding conductor in place of the grounded conductor.

3.3 GROUNDING

A. Connect wiring device grounding terminal to branch circuit equipment grounding conductor.

3.4 IDENTIFICATION

A. Identify wiring devices with circuit number as required in Section 16050, *Basic Electrical Materials and Methods*.

B. Identify both ends of occupancy-sensing lighting/receptacle control system Class 2 control cables with wire markers indicating "from" and "to" information.

3.5 FIELD QUALITY CONTROL

A. Inspect each wiring device for defects before installing.

B. Operate each operable device at least six times with circuit energized; verify proper operation.

C. Test 15 and 20 ampere receptacles for proper polarity and ground continuity using an NRTL listed test device that impresses a momentary current of at least 15 amperes on the branch circuit conductors and equipment grounding path.

D. Test ground-fault circuit interrupter receptacle operation with both local and remote fault simulations according to manufacturer recommendations.

1. Verify that GFCI will trip at 5 ±1 mA current
2. Verify that GFCI does not trip at less than 1.8 mA current.

E. Replace damaged or defective wiring devices.

3.6 CLEANING AND ADJUSTING

A. Clean devices and wall plates. Replace stained or improperly painted wall plates or devices.

B. Adjust devices and wall plates to be flush and level.

END OF SECTION

SECTION 16269
ADJUSTABLE FREQUENCY AC CONTROLLERS

PART 1 GENERAL

1.1 SECTION INCLUDES

Configured adjustable frequency AC controllers (AFCs) for use with NEMA B design AC squirrel-cage induction motors.

1.2 MANUFACTURERS

TOSHIBA brand VFD or Engineer approved "or equal".

1.3 SUBMITTALS

Submit the following in accordance with project submittal procedures:

1. Catalog Data: Submit catalog data describing each type of AFC. Include data substantiating that materials comply with specified requirements. Provide catalog sheets showing voltage, controller size, ratings and size of switching and overcurrent protective devices, short circuit ratings, dimensions, and enclosure details.
2. Calculations:
    a. Submit calculations showing de-rating and selection of each AFC for the specified altitude, ambient temperature, and carrier frequency.
    b. If the total connected kVA of AFCs exceeds 15 percent of the self-cooled kVA rating of the facility service transformer submit evaluation of harmonic distortion at the point of common coupling (PCC) using computer simulation of the distribution system and connected AFCs. The PCC for voltage distortion shall be at the secondary of the utilization voltage service transformers. The PCC for current distortion shall be at the primary of the utilization voltage service transformers. Use procedures outlined in IEEE 519-1992, *IEEE Recommended Practices and Requirements for Harmonic Control in Electric Power Systems*. Assume that all connected AFCs operating at 80% speed.
3. Certification: Submit certification and backup information that AFC can perform required functions after a design earthquake as specified in "SERVICE CONDITIONS" below.
    a. AFC designated with I_p greater than 1.0 shall be certified by the manufacturer to withstand the total lateral seismic force and seismic relative displacements specified in the *International Building Code* (IBC) or ASCE 7, *Minimum Design Loads for Buildings and Other Structures.*
    b. Certification shall be based on 3-axis shake table testing of similar products.

c. Required response spectra shall exceed 1.1 times the in-structure spectra determined in accordance with IBC AC156, *Acceptance Criteria for Seismic Qualification by Shake-Table Testing of Nonstructural Components and Systems*.

4. Certification: Submit certification by manufacturer's field technical representative that the subcontractor has installed, adjusted, and tested each AFC according to the manufacturer's recommendations.
5. Shop Drawings: Submit shop drawings for each AFC including dimensioned plans and elevations and component lists. Include front and side views of enclosure showing overall dimensions, enclosure type, enclosure finish, unit locations, and conduit entrances.
6. Installation Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, installation, and starting of Product.
7. Operation and Maintenance Instructions: Submit operation and maintenance instructions.
8. Test Reports: Submit results of required factory tests.
9. Warranty: Provide a 3-year parts warranty, on materials and workmanship, and 1-year labor warranty from the date of field certification by manufacturer's representative of satisfactory operation.

1.4 QUALITY ASSURANCE

Comply with the *National Electrical Code* (NEC) for components and installation.

Provide products that are listed and labeled by a Nationally Recognized Testing Laboratory (NRTL) for the application, installation condition, and the environment in which installed.

Comply with the applicable requirement of the latest NEMA ICS 3.1 – Safety Standards for Construction and Guide for Selection, Installation and Operation of Adjustable Speed Drive Systems, IEEE 519, and FCC Part 15 Subpart J.

The manufacturer of the AFC shall be a certified ISO 9001 facility.

The manufacturer's turn around period to repair or replace the AFC shall be no more than 36 hours.

Perform the following factory tests on each AFC:

1. Test every power converter (a component of the AFC) with an actual AC induction motor 100% loaded and temperature cycled to the full range of the AFC. Monitor the power converter for correct phase current, phase voltages, and motor speed. Verify current limit operation by simulating a motor overload.
2. Verify proper factory presets by scrolling through all parameters to ensure proper microprocessor settings. Verify proper functioning of all input and output ports.

3. Test all AFC door mounted pilot devices to verify proper function.
4. Functionally test all options including operation of a motor in the bypass mode if supplied. Verify proper setting of motor overload protection.
5. Test the AFC wiring for continuity, shorts, and unintended grounds with all enclosed devices mounted and wired.

1.5 COORDINATION

Coordinate the features of each AFC with the ratings and characteristics of the supply circuit, the motor, the required control sequence, the duty cycle of the motor, drive, load, the pilot device, and control circuit affecting controller functions. Furnish AFCs rated to suit the motor controlled in the specified conditions.

Coordinate the communications protocol with the building automation system; refer to Section 15900 – *Building Automation System.*

1.6 SERVICE CONDITIONS

AFCs shall perform satisfactorily in the following service conditions without mechanical or electrical damage or degradation of operating characteristics:

1. Operating elevation of 470 feet above sea level.
2. Operating ambient temperature extremes of 32 to 104 degrees F.
3. 24-hour average operating ambient temperature not exceeding 86 °F.
4. Operating relative humidity: 0 to 95 percent, without condensation.
5. International Building Code seismic criteria:
   a. Seismic Design Category = Zone 4
   b. S_{DS} = spectral acceleration, short period = 0.75g
   c. S_{D1} = spectral acceleration, 1-second period = 0.64g
   d. a_p = component amplification factor = 2.5
   e. R_p = component response modification factor = 6.0
   f. I_p = component importance factor
      I_p = 1.5 for life safety related components such as emergency system AFCs
      I_p = 1.5 for safety class or safety significant system AFCs.
      I_p = 1.0 for all other AFC applications

Maximum solar heat gain: 110 W/sq ft.

1.7 RECEIVING, STORING AND PROTECTING

Receive, store, and protect, and handle products according to NECA 1—*Standard Practices for Good Workmanship in Electrical Construction.*

1.8 EXTRA MATERIALS

Furnish six spares of each size and type fuse required.

1.9 PROJECT RECORD DOCUMENTS

Submit the following in accordance with Section 01720 *Field Record Drawings*

1. Parameter Settings: For each AFC provide a listing of all drive parameter settings that were changed from the manufacturer's default settings.
2. Test reports and certifications indicated in FIELD QUALITY CONTROL article.

PART 2 PRODUCTS

2.1 PRODUCT OPTIONS AND SUBSTITUTIONS

Alternate products may be accepted; follow requirements of *Standard Specifications for Public Works Construction* ("Whitebook"), 2015 edition.

2.2 ADJUSTABLE FREQUENCY AC CONTROLLER

Provide UL508C listed and labeled configured adjustable frequency AC controller(s) (AFCs) as indicated on the Drawings and specified in this Section. NEMA 1 enclosed AFCs shall be UL-1995 listed for mounting in plenums and compartments handling conditioned air.

Each configured AFC shall be an integrated assembly with an externally operated disconnect device, transient voltage surge suppression, current-limiting fuses, line input reactor, power converter, cooling fans, operator interface, control system interface, control power transformer, [3-contactor bypass system,] and a suitable enclosure.

Provide fusible switch type externally operable disconnect. Disconnect handle shall have provisions for locking in the OFF position with up to 3 padlocks. Mechanical interlocks shall prevent opening the enclosure door with disconnect in the ON position and shall prevent moving disconnect to the ON position with enclosure door open.

Provide current-limiting drive branch circuit fuses in the disconnect switch. Select fuses to protect the input rectification circuit. Use Class J fuses with interrupting rating of 200,000 AIC. The series interrupting rating of the AFC and fuses shall be a minimum of 30,000 AIC and shall be stated in the AFC Instruction Manual as required by UL

Provide a three phase 3% minimum impedance input line reactor in the AFC cabinet to minimize drive harmonics on the AC line and protect the drive from damaging electrical system transients. Provide additional input filtering as required to limit line current total harmonic distortion (THD) to less than 10 percent.

Provide power converter that is microprocessor based using insulated gate bipolar transistors and pulse width modulation (PWM) technology and is suitable for low-noise operation of adjustable torque loads such as centrifugal pumps and fans.

1. Input voltage shall be either 200-230 or 380-480 Vac as indicated on the drawings.

a. Power converter shall be able to withstand voltage variations of -15 percent to +10 percent and imbalance of 3 percent without tripping or affecting drive performance.

b. Power converter shall operate with input frequency of 60 Hz and shall withstand a frequency variation of +5 percent to -5 percent.

c. Power converter displacement power factor shall be not less than 0.95 lagging under any speed or load condition.

d. The efficiency of the power converter shall be not less than 96 percent at full speed and full load.

e. Line notches, transients, and harmonics on incoming line shall not affect power converter performance.

f. Power converter shall include provisions for a DC link inductor. Power converters 100 HP and above shall be supplied with DC link inductor in addition to the input line reactor.

2. Power converter output shall be capable of continuously operating the connected variable torque motor load over the complete speed range at an elevation of 470 feet in an ambient temperature of +40 degrees C operating at the specified carrier frequency.

a. Current rating of the power converter shall be based on a carrier frequency of 8 kHz for AFCs 1-75 HP and 4 kHz for AFCs 100-400 HP. All HP ratings shall meet or exceed Table 430.150 of the National Electric Code. Rated three-phase motor full load current, HP, maximum current and rated voltage shall appear on the power converter nameplate.

b. Power converter output voltage shall vary with frequency to maintain a constant volts/hertz ratio up to 60 Hz output. Constant or linear voltage output shall be provided above 60 Hz.

c. Power converter rated output voltage shall be programmable to match motor nameplate voltage.

d. The power converter one-minute overload rating shall be not less than 120 percent of rated current, adjusted for altitude.

e. The power converter shall be able to operate with its output disconnected for troubleshooting and startup.

f. PWM carrier frequency shall be field adjustable with a minimum range of 2 kHz to 6 kHz to minimize the level of audible motor noise.

g. Motor acceleration and deceleration shall be programmable from one second to not less than 60 seconds.

h. For fan service, provide controller with not less than 3 programmable critical frequencies that can be skipped to avoid mechanical resonances.

i. Power converter shall not generate damaging voltage pulses at the motor terminals when located within 200 feet of the motor. Power converter shall comply with NEMA MG1 section 30.40.4.2.

3. Supply the power converter with interface modules as required to provide the following control functions and external signals:

    a. Automatic control using ANSI/ASHRAE Standard 135, ISO 16484-5 approved BACnet compatible network protocol over an RS-485 communications system from the building automation system. This communications port shall provide direct communication between the drive microprocessor and the building automation system. All configuration and control functions shall be accessible through this port and fault diagnostics, start/stop, speed commands, and all drive feedback variables shall be available. Discrete signals such as Bypass Run or Interlock Open shall also be mapped through the drive terminal strip to the system for unitary control. The communications port shall have the ability to be used in a "monitor only" mode where control shall be from a digital controller directly wired to the drive.

    b. Six configurable digital inputs, factory pre-set for common HVAC control interface to minimize customization at start up.

    c. Two isolated analog inputs with 0-20 mA, 4-20 mA or 0-4 V, 0-8 V, and 0-10 V selectable parameters. Both shall be capable of providing speed feedback for internal PI setpoint control loop. Either may be mapped to communication port for unitary control of temperature, pressure, or other analog control functions.

    d. Isolated 0-10 V output signal proportional to speed or load as required to interface with control system

    e. Not less than two sets of NEMA ICS 2 field-convertible auxiliary contacts to signal the following conditions:

    1) Drive run.
    2) Drive fault.

4. Provide the power converter with the following protective features:

    a. Class 10 or 20 electronic overload circuit designed to protect AC motor operated by the AFC output from extended overload operation. No additional hardware such as motor overload relays or motor thermostats shall be required.

    b. Output phase-to-phase short circuit protection.

    c. Output ground fault protection.

    d. High input line voltage.

    e. Low input line voltage.

    f. Loss of input or output phase.

    g. Drive overcurrent.

    h. Drive over-temperature.

    i. Stall protection.

    j. Transient voltage surge suppression up to 6000 volts peak per IEEE C62.41.

The AFC shall have the capability of riding though power dips up to 10 seconds without a controller trip depending on load and operating condition. The AFC shall automatically restart after a longer power interruption.

Provide the following operator interfaces mounted on the cover of:

1. Touch keypad and LCD screen that digitally indicates:
    a. Frequency output
    b. Voltage output
    c. Current output
    d. Motor RPM
    e. Motor kW
    f. Elapsed Time
    g. Time Stamped Fault Indication
    h. DC Bus Volts
    i. Faults
    j. PI running, PI setpoint
    k. Parameter settings
2. Heavy duty, 22 mm or 30 mm, metal operator, oil tight pilot devices as listed below with NEMA ICS 2, Form Z, A600 rated contacts:
    a. Push buttons: Mushroom head, maintained action, turn-to-release emergency STOP pushbutton.
    b. Push-to-test LED type indicating lights:
        1) White POWER ON pilot light.
        2) Yellow FAULT pilot light.
        3) Red RUNNING pilot light.
        4) Green STOPPED pilot light.
    c. Speed Control Selector Switch: Rotary type LOCAL - OFF - REMOTE.
3. Provide legend plates for pushbuttons, pilot lights, potentiometer, and selector switch.

Provide labeled terminal block connections for safety interlocks, fault contacts, normal operational functions such as run/stop, remote references, mode control, external emergency stop, and external emergency full-speed.

Provide the AFC with 3-contactor isolation and bypass system.

1. Provide interlocked isolation and bypass contactors, electronic overload relay, fused disconnect interlocked with the door, motor flux decay timer and AFC-TEST-BYPASS selector switch.
    a. In the AFC position the power converter shall provide adjustable frequency speed control of the motor under non-fault conditions. When the power converter is under a fault condition the

contactors shall be automatically energized upon power converter shutdown (Drive fault contact operation) to isolate the power converter and operate the motor, across the line, on 60 Hertz line power through the overload relay.

b. In Drive Test mode, the drive-input contactor shall be closed to keep the power on to the drive, and the drive-output contactor open. This shall enable the user to test the drive before running the motor. A jumper shall be added to test the drive while bypass is running the motor and must be field installed to alert operators of this condition.

c. In bypass mode, the drive-input and the drive-output contactor will be open to isolate the drive. The bypass contactor will be open to allow the motor to run directly from the AC line. Bypass motor overload protection shall be provided by electronic Class 20 adjustable overload relay.

2. Provide relay control logic within the AFC enclosure to allow the same "START/STOP" and "EMERGENCY STOP" commands to operate the motor in either the AFC or BYPASS mode.

3. Provide push-to-test LED indicator lights to annunciate bypass status and alarms.

Provide a control power transformer in each enclosed AFC. The transformer shall have 120-volt secondary and sufficient capacity to operate all connected cooling fans, pilot, indicating and control devices, plus 100 percent spare capacity. Provide fused primary and secondary. Bond un-fused leg of secondary to enclosure. Provide fuse blown indicating fuses.

Provide auxiliary control relays where required to accomplish interlocks and control sequences. Relays shall be heavy-duty general-purpose type, having 115 volt 60 Hertz operating coils.

Provide the AFC with cooling air fan(s) and/or heat sink construction as required for maintaining the temperature of components within operating limits. Provide filtration for cooling air as required for the installation and operating environment.

Provide AFC enclosure in accordance with ANSI/NEMA ICS 6 - Enclosures for Industrial Controls and Systems as required to meet conditions of installation and operation.

AFCs shall meet the radio frequency energy emission limits of FCC Part Class A and also the IEC 61800-3 – EMC Product Standard for Power Drive Systems emission limits for Restricted Distribution and installation in the First Environment. Installation manual shall include instructions for installing the drive equipment so that it meets the specified emission limits as installed.

Manufacturer: Toshiba, Allen-Bradley, or approved equal.

PART 3 EXECUTION

3.1 EXAMINATION

Examine surfaces to receive control equipment for compliance with installation tolerances and other conditions affecting performance of the control system. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

Install AFCs indicated on the Drawings and according to manufacturer's instructions. Manufacturer's installation instructions shall be available at the construction site.

Mount with digital display panel 5'-0" above floor or as indicated on the Drawings.

Install enclosed controllers plumb. Provide supports in accordance with the requirements of Section 16050 *Basic Electrical Materials and Methods* and the NEC.

Ground and bond motor controllers and control devices as required in Section 16050 *Basic Electrical Materials and Methods.*

Identify motor controllers and install warning signs as required in Section 16050 *Basic Electrical Materials and Methods*

Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. Where manufacturer's torque values are not furnished, use those specified in UL Standard 486A-486B.

Set overload relays or install overload heater elements in motor controllers to match installed motor characteristics.

Provide neatly typed label inside each motor starter enclosure door identifying motor served, nameplate horsepower, full load amperes, code letter, service factor, and voltage/phase rating. Place label in clear plastic holder.

3.3 FIELD QUALITY CONTROL

Clean, inspect, test, adjust, and energize AFCs in accordance with the manufacturer's instructions.

1. Inspect each AFC for physical damage, proper alignment, and proper anchorage.
2. Configure AFC parameters to match requirements of the served system.
3. Keep records of inspections, tests, configurations, and adjustments for each AFC; submit them to the City

Coordinate inspections and tests with those required by Section 16950 – *Electrical Tests.*

After completing installation, cleaning, and testing, touch-up scratches and mars on finish to match original finish.

3.4 MANUFACTURER'S FIELD SERVICE

Provide the services of a factory trained representative from the AFC manufacturer to inspect and certify the installation and to oversee energizing and testing.

Manufacturer's representative shall certify in writing that each AFC has been installed, adjusted, and tested in accordance with the manufacturer's recommendations.

Provide one full work day of training for up to three City representatives at the project site. A manufacturer's qualified representative shall conduct training session. The training program shall consist of instruction on the operation and maintenance of the AFC.

END OF SECTION

SECTION 16271
MEDIUM-VOLTAGE TRANSFORMERS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following types of transformers with medium-voltage primaries:
   1. Pad-mounted, liquid-filled transformers.

1.2 SUBMITTALS

A. Product Data: Include rated nameplate data, capacities, weights, dimensions, minimum clearances, installed devices and features, location of each field connection, and performance for each type and size of transformer indicated.

B. Shop Drawings: Wiring and connection diagrams including power, signal and control wiring.

C. Coordination Drawings: Floor plans drawn to 1/4 inch scale and coordinating floor penetrations and floor-mounted items. Show the following:

   1. Underground primary and secondary conduit stub-up locations.
   2. Dimensions of concrete pad, outline of transformer, and required clearances.
   3. Ground rod and grounding cable locations.

D. Manufacturer Seismic Qualification Certification: Submit certification that transformer assembly and components will withstand seismic forces defined in Section 16050, *Basic Electrical Materials and Methods*. Anchor calculations signed and stamped by a California registered Structural Engineer shall be submitted with shop drawings for review.

E. Factory test reports.

F. Field quality-control test reports.

G. Follow-up service reports.

H. Installation Instruction.

I. Operation and Maintenance Data: For transformer and accessories to include in emergency, operation, and maintenance manuals.

1.3 QUALITY ASSURANCE

A. American made products have been acceptable to the City. If non-domestic products are submitted, notice is hereby given that extensive testing shall be required to insure quality and conformance to the Specifications. Testing shall be done by a recognized lab acceptable to the City and all tests shall be witnessed by City personnel. All testing procedures and test results shall be satisfactory to the City. Contractor shall be responsible for arranging the tests, for transportation, food and lodging for minimum of one City Engineer to witness the test at the testing lab. Include all costs for the above in the bid.

B. Transformer Manufacturer shall have ISO 9001 and 9002 Certification. Manufacturer shall have ability to readily provide replacement parts for a minimum period of ten years, from the date of completion of the project.

C. Transformer shall be manufactured within 12 months of installation.

D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

E. Transformer shall comply with:

1. Institute of Electrical and Electronic Engineers, IEEE C2, IEEE C57.12.10, IEEE C57.12.70, and IEEE C57.12.80.
2. American National Standard Institute, ANSI C57.12.28.
3. National Fire Protection Association (NFPA).
4. State of California Code of Regulations (CCR)

1.4 DELIVERY, STORAGE, AND HANDLING

A. Store transformers protected from weather and so condensation will not form on or in units. Provide temporary heating according to manufacturer's written instructions.

1.5 COORDINATION

A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 3 and Section 05550 Anchorage in Concrete and Masonry.

B. Coordinate installation of louvers, doors, spill retention areas, and sumps. Coordinate installation so no piping or conduits are installed in space allocated for medium-voltage transformers except those directly associated with transformers.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following, or equal: Transformers are furnished and installed by the contractor.

1. CG Power Systems USA Inc.

2.2 PAD-MOUNTED, LIQUID-FILLED TRANSFORMERS

A. Description: ANSI C57.12.13, IEEE C57.12.00, IEEE C57.12.26, compartment type, self cool, tamperproof and weatherproof, pad-mounted, 2-winding or 4-winding transformers. Transformer shall be of seal tank construction. Coils shall be wound with copper conductors. High- and low-voltage compartments shall be located side by side, separated by a steel barrier.

B. Insulating Liquid: Less flammable, dielectric, bio-degradable liquid (FR3, Envirotemp, or seed oil based).

C. Insulation Temperature Rise: 55 deg C when operated at rated kVA output in a 40 deg C ambient temperature. Transformer shall be rated to operate at rated load in an average ambient temperature of 30 deg C over 24 hours with a maximum ambient temperature of 40 deg C without loss of service life expectancy.

D. Transformer shall be rated as indicated on drawings. Primary voltage is **12KV**. Secondary voltage is **480/277V**.

E. Basic Impulse Level: **95kV**.

F. Full-Capacity Voltage Taps: Four 2.5 percent taps, 2 above and 2 below rated high voltage; with externally operable tap changer for de-energized use and with position indicator and padlock hasp.

G. High-Voltage Compartment:

1. Provide a load break, gang operated, liquid immersed rotary switch externally operable from high-voltage compartment through use of a distribution hot-stick.
2. Primary protection shall be provided as follows: 1000kVA and below: Provide dry WELL BAY-O-NET type liquid immersed fuses rated for minimum 750 MVA (RMS Symm.) interrupting rating in series with liquid immersed current limiting fuses. WELL BAY-O-NET fuses are to be externally replaceable with a hot stick without opening the transformer tank.
3. Surge Arresters: Distribution class, **12kV, 10.2 MCOV** rated, one for each primary phase; complying with IEEE C62.11 and NEMA LA 1. Support from tank wall within high-voltage compartment. Transformer shall have three arresters for loop feed circuits. Note: surge arresters are not included with the furnished transformers. Provide and install surge arresters.

H. High-Voltage Terminations and Equipment: 200A, dead front with universal-type bushing wells for dead-front bushing-well inserts, complying with IEEE 386 and including the following:

1. Bushing-Well Inserts: One for each high-voltage bushing well.
2. Surge Arresters: Dead-front, elbow-type, metal-oxide-varistor units.
3. Parking Stands: One for each high-voltage bushing well.
4. Portable Insulated Bushings: Arranged for parking insulated, high-voltage, load-break cable terminators; one for each primary feeder conductor terminating at transformer.
5. Provide three separate 200A bushings for surge arresters.

I. Low-Voltage Compartment Bushings: Molded epoxy, with blade type spade terminals with NEMA standard hole spacing arranged for vertical take off. Low-voltage neutral shall be an insulated bushing, grounded to tank by a removable ground strap. Location as shown on Drawings.

J. Accessories:

1. Drain Valve: 1 inch, with sampling device.
2. Dial-type thermometer.
3. Liquid-level gage.
4. Pressure-vacuum gage.
5. Pressure Relief Device: Self-sealing, with indicator.
6. Mounting provisions for low-voltage current transformers and potential transformers.
7. Busway terminal connection at low-voltage compartment.
8. Alarm contacts for gages and thermometer listed above.
9. Molded case circuit breaker in low voltage compartment, rated as shown on drawings.

K. Enclosure: Stainless steel with factory applied powder coated standard **ANSI 61 gray** exterior finish over a rust inhibiting primer on treated metal surface. When transformer is mounted adjacent to other equipment, finish color shall match the color of adjacent equipment such as 15KV switch, unit substation, etc. Furnish a minimum of three (3) years warranty against corrosion.

2.3 IDENTIFICATION DEVICES

A. Nameplates: Engraved, laminated-plastic or metal nameplate for each transformer, mounted with corrosion-resistant screws. Nameplates and label products are specified in Section 16050, *Basic Electrical Materials and Methods*.

2.4 SEISMIC RESTRAINTS

A. Design and fabricate transformers, and anchorage devices for them, to withstand static and seismic forces in any direction.

2.5 SOURCE QUALITY CONTROL

A. Factory Tests: Perform design and routine tests according to standards specified for components. Conduct transformer tests according to ANSI C57.12.50, C57.12.51, IEEE C57.12.90 and IEEE C57.12.91; include, as a minimum, the following tests:

1. Resistance measurements of all windings on rated-voltage connection and on tap extreme connections.
2. Ratios.
3. Polarity and phase relation.
4. No-load loss.
5. Excitation current.
6. Impedance.
7. Load loss.
8. Applied potential.
9. Induced potential.
10. QA impulse test.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions for compliance with requirements for medium-voltage transformers.

B. Examine roughing-in of conduits and grounding systems to verify the following:

1. Wiring entries comply with layout requirements.
2. Entries are within conduit-entry tolerances specified by manufacturer and no feeders will have to cross section barriers to reach load or line lugs.

C. Examine walls, floors, roofs, and concrete bases for suitable mounting conditions where transformers will be installed.

D. Verify that ground connections are in place and that requirements in Section 16050, *Basic Electrical Materials and Methods* have been met. Maximum ground resistance shall be 5 ohms at location of transformer.

E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install transformers on concrete bases.

1. Install exterior pad mount transformer on an underground handhole with concrete pad on top. Handhole shall have concrete barrier separating primary and secondary incoming cable sections.

2. Anchor transformers to concrete bases according to manufacturer's written instructions, seismic codes at Project, and requirements in Section 16050, *Basic Electrical Materials and Methods.*
3. Construct concrete bases of dimensions indicated, but not less than 4 inches larger in both directions than supported unit and 4 inches high.
4. Use 3000-psi, 28-day compressive-strength concrete and reinforcement. Install dowel rods to connect concrete bases to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around full perimeter of base.
5. Install epoxy-coated anchor bolts, for supported equipment, that extend through concrete base and anchor into structural concrete floor.
6. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
7. Tack-weld or bolt transformers to channel-iron sills embedded in concrete bases. Install sills level and grout flush with floor or base.
8. Grounding shall be in accordance with ANSI C2. Tank ground pads shall connect to solid earth ground.

B. Maintain minimum clearances and workspace at equipment according to manufacturer's written instructions and NFPA 70. Provide 8'-0" minimum clearance at the front of the transformer.

C. Provide warning signs.

3.3 IDENTIFICATION

A. Identify field-installed wiring and components and provide warning signs as specified in Section 16050, *Basic Electrical Materials and Methods.*

3.4 CONNECTIONS

A. Ground equipment according to Section 16050, *Basic Electrical Materials and Methods.*

B. Connect wiring according to Section 16050, *Basic Electrical Materials and Methods.*

C. 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 and UL 486B.

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Engage an independent qualified testing and inspecting agency to perform field tests and inspections and prepare test reports. For additional information, refer to Section 16950, *Electrical Tests.*

B. Examine roughing-in of conduits and grounding systems. Verify:

1. Wiring entries comply with layout requirements.
2. Entries are within conduit-entry tolerances specified by manufacturer and no feeders will have to cross section barriers to reach load or line lugs.
3. Ground connections are in place. Maximum ground resistance shall be 5 ohms at location of transformer.

C. Remove malfunctioning units, replace with new units, and retest as specified above.

D. Test Reports: Prepare written reports to record the following:

1. Test procedures used.
2. Test results that comply with requirements.
3. Test results that do not comply with requirements and corrective actions taken to achieve compliance with requirements.

3.6 FOLLOW-UP SERVICE

A. Voltage Monitoring and Adjusting: Perform the following voltage monitoring after Substantial Completion but not more than six months after Final Acceptance:

1. During a period of normal load cycles as evaluated by the City, perform seven days of three-phase voltage recording at secondary terminals of each transformer. Use voltmeters with calibration traceable to National Institute of Science and Technology standards and with a chart speed of not less than 1 inch per hour. Voltage unbalance greater than 1 percent between phases, or deviation of any phase voltage from nominal value by more than plus or minus 5 percent during test period, is unacceptable.
2. Corrective Actions: If test results are unacceptable, perform the following corrective actions, as appropriate:

    a. Adjust transformer taps.
    b. Prepare written request for voltage adjustment by electric utility.

3. Retests: After corrective actions have been performed, repeat monitoring until satisfactory results are obtained.
4. Report: Prepare written report covering monitoring and corrective actions performed.

B. Perform infrared scanning.

3.7 WARRANTY

A. The complete assembly shall have a minimum two-year warranty. Warranty shall include labor and parts required to repair or replace the switch on site. Submit warranty in accordance with Division 1 requirements.

END OF SECTION

SECTION 16290
POWER MONITORS

PART 1 - GENERAL

1.1 REQUIREMENTS

A. The Switchboard manufacturer shall install power monitors, current transformers, and potential transformers, all in accordance with the intent and requirements of the Contract Documents.

B. Nameplates shall be furnished as specified in Section 16050, Basic Electrical Materials and Methods.

1.2 REFERENCE CODES AND STANDARDS

A. All work specified herein shall conform to or exceed the applicable requirements of the referenced portions of the following publications to the extent that the provisions thereof are not in conflict with other provisions of these specifications.

1. Codes and Standards:

NEC	National Electrical Code
NESC	National Electrical Safety Code (ANSI C2)
UL	Underwriters Laboratories
CBEMA	Computer Business Equipment Manufacturers Association

2. Industry Standards

ANSI C12.20	Electricity Meters 0.2 and 0.5 Accuracy Classes
ANSI C2	National Electrical Safety Code
ANSI C.62.41	IEEE Recommended Practice on Surge Voltages in Low-Voltage AC Power Circuits
FCC Part 15	
Subpart B, Class A	Electromagnetic Emission
Standards IEC60687 0.2S	Standards for Metering

Accuracy	
IEC1000	Electromagnetic Compatibility Limitations on Voltage Fluctuations
ENV51040	IEC Standard for Radiated EM Field Immunity
ENV51041	IEC Standard for Conducted EM Field Immunity
EN50081-2	IEC Standard for Electromagnetic Compatibility, Emissions
EN50082-2	IEC Standard for Electromagnetic Compatibility, Immunity
EN55011 (CISPR 11)	IEC Standard for Radiated/Conducted Emissions
EN55022 (CISPR 22)	IEC Standard for Radiated/Conducted Emissions
IEEE C.37.90.1	Standard for Surge Withstand Capacity for Protective Relays and Relay Systems
UL 3111-1	Electrical Measuring, Testing and Signal Generation Equipment

1.3 SYSTEM DESCRIPTION

A. The power monitors shall be mounted as indicated on the contract documents, in the control section of the appropriate breaker cubicle.

B. Appropriate potential transformers and current transformers shall be furnished to provide sensing signals for the power monitors.

C. Installation of power monitors, ancillary equipment, and wiring connections to all electrical circuits, and terminal strips for external devices shall conform to all local and national electrical codes.

D. Shorting switches or test blocks shall be required for all metering CT inputs.

1.4 SUBMITTALS

A. The power monitor supplier shall provide technical data sheets, installation manuals and/or user documentation manuals that describe the product installation and operation, physical data, electrical characteristics and connection requirements of the power monitor.

1.5 QUALITY ASSURANCE

A. The power monitor supplier's quality assurance process shall be certified by an independent certification agency to meet ISO 9001 quality assurance standards.

B. The final MCC lineup incorporating the power monitors must be UL certified and labeled by the assembler.

C. The power monitors shall be calibrated at the factory using an instrument that is certified to have been calibrated using standards whose accuracies are traceable to the National Institute of Standards and Technology (NIST).

1.6 SITE CONDITIONS

A. The power monitors shall be capable of operating under the following environmental conditions:

1. Temperature: 40°F to 95°F

2. Humidity: 5% to 95% non-condensing

1.7 WARRANTY

A. The power monitors shall be warranted by the manufacturer against manufacturing defects for a period of three (3) years including parts and labor.

B. Warranty service may be performed by the manufacturer or authorized representative.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. The power monitors shall be manufactured by Square D, Eaton PXM2260 series, or equal, with the following options:

1. Ten megabyte (MB) memory upgrade

2. The 10Base-FL Ethernet port and TCP/IP protocol with all associated drivers and supporting hardware.

3. Analog auxiliary card which accepts (4) 0-20mA inputs and delivers (4) 0-20mA (scalable to 4 to 20mA) outputs

4. Current transformers rated 10 amperes each for all monitored phases.

2.2 POWER MONITORS

A. The power monitor shall be a multi-function 3 phase solid state unit with ability to connect to either 3 phase, 4 wire wye or 3 phase, 3 wire delta circuits.

B. Capabilities for voltage and current inputs to the meter shall conform to the following at a minimum:

1. The power monitor shall accept input of four (4) independent voltage inputs and five (5) independent current inputs of the stated capacity.

2. Voltage input shall be120 volts AC with available option for direct connection to voltage circuits of up to 600 VAC without the use of potential transformers.

3. Voltage input shall have an overload capacity of 1500VAC RMS continuous and a dielectric withstand capability of 2500 volts AC, 60Hz for one minute.

4. Current input shall be rated for 5 amps with a continuous input capability of 20 amps.
5. Current inputs shall be Class 10, rated for a 1-second over-current rating of 500 amps, non-recurring, and 20 amps continuous.

C. The power monitor shall measure and report the following quantities at a minimum:

1. Voltage, intervals must be available simultaneously both phase to neutral and phase to phase, for all three phases; Auxiliary voltage; Phase angles for each voltage relative to each other.

2. Current, phase A, B, C, N-measured, and N-calculated; Phase angles for each current relative to voltages.

3. Watts (total and per phase), VARs (total and per phase), VA (total and per phase), Power Factor (total and per phase) and Frequency.

4. Accumulated Watt-hr, VA-hr, and VAR-hr; Watt-hr received; Watt-hr delivered.

5. Updates of all voltage and current readings at intervals of 1/2 cycle and 1 second. Readings shall be available for both metering and control. All specified readings shall be made available via the RS-485 ports.

6. Time-stamped maximum and minimum readings for every measured parameter

7. Coincident VAR readings for all maximum Watt readings

D. Power monitor shall provide the following accuracies:

1. Voltage accuracy shall be within less than 0.1% for the 1 second readings.

2. Current accuracy shall be within less than 0.1% for the 1 second readings.

3. Power and energy accuracy shall be class 0.2.

4. Frequency accuracy shall be within +/- 0.005 Hz or better.

E. Power demand shall be able to be calculated using either of two (2) methods: Thermal Demand or Sliding Window Demand (Rolling Block).

F. Power monitor shall provide multiple digital communication ports and support multiple open protocols.

1. Meter shall include four (4) independent, digital communications ports. Each port shall be RS-485 architecture. Port 1 shall be user selectable as either RS-232 or RS-485 architecture.

2. Each port shall be user configurable with regard to speed, protocol, address, and other communications parameters. Ports shall support a maximum communication speed of 115k baud simultaneously.

3. One communications port shall be configurable as either a master or a slave port. The master configuration shall enable the unit to act as an RTU and interface with other Modbus devices.

4. Meter shall have an Ethernet RJ45 (10BaseT) port and an Ethernet Fiber (10BaseFL) port. All instantaneous data, logged data, event data, power quality analysis and waveform information shall be available using these open protocols.

G. Power monitor shall provide sequence of events capture and recording.

H. Power monitor shall be capable of time synchronizing to GPS time signal.

I. Power monitor shall provide an external display to accommodate access to readings locally and/or remotely.

J. Power monitor shall be equipped with a minimum of 10 MB of non-volatile RAM.

1. Meter shall store historical trending data, power quality data, and waveform recordings in memory.

2. In the event of loss of control power, data stored in memory shall be retained

3. Memory shall be allocated to the various logging functions required.

All logging features required shall be simultaneously available at the specified levels. Exercising any one feature at the specified level shall not limit exercising of any or all other features to their full, specified level.

4. Meter shall store all programming and set-up parameters in non-volatile memory. In the event of loss of control power, meter programming data stored in memory shall be retained.

K. Power monitor shall provide historical data logging for trending of measured values.

1. The historical log shall be user configurable. User may select measured quantities and reading intervals for each log.

2. The historical log shall record data where 10 readings are being stored every 15 minutes.

L. Power monitor shall provide extensive power quality monitoring capability.

1. Power monitor shall measure and record the magnitude and phase angle harmonics for all voltages and currents. Meter shall provide %THD and K-Factor for all channels.

2. All harmonic values shall be available through the digital communications ports.

3. Power monitor shall capture and record all CBEMA quality events.

4. Entries to the Limits log shall be time stamped to the millisecond and include the measured quantity value and label.

M. Power monitor shall provide waveform recording to capture and record transients and quality problems on current and voltage waveforms.

1. Meter shall hold over 60 records of waveform recording in non-volatile memory. Each record shall be a minimum of 8 cycles duration at the highest sample rate or 64 cycles duration at the lowest sample rate.

N. The power monitor shall provide the following functionality:

1. Arithmetic (+, -, X, /)

2. Trigonometric functions: COS, SIN, TAN, ARCCOS, ARCSIN, ARCTAN, LN, LOG10

3. Comparison and Logic functions: =, =>, <=, <>, <, >, AND, OR, NOT, IF

O. The power monitor shall support direct display of all parameters on the front panel in user programmable groups, using plain language labels. Simultaneous access

to all parameters shall be available through any communication port.

P. The power monitor shall be field programmable as follows:

1. Basic parameters: Voltage input scale, voltage mode (wye, delta, single phase), current input scale, auxiliary input and output scales, and communications setup parameters are programmable. All basic parameters plus additional setpoint/relay and data log setup parameters shall be programmed via the communications port using a portable or remotely located computer terminal.

2. The power monitor shall support customized configurations of all operating parameters.

3. Provisions shall be made to ensure that programming through a computer can be secured by user ID and password.

4. Provisions shall be made to ensure that programming through the front panel is secured by password.

PART 3 - EXECUTION

3.1 INSTALLATION

A. All power supply and communications wiring connections shall be performed in accordance with the guidelines set out in the product documentation.

B. All current and voltage sensing connections to the power monitor shall be made using appropriately rated CT shorting blocks and PTs.

3.2 FIELD QUALITY CONTROL

A. The power monitor supplier shall offer field services to provide quality control with on- site personnel for installation, training, and start-up, as included in the project bid.

3.3 ADJUSTING

A. The power monitor supplier shall offer field services to assist on-site personnel with re-configuration of the factory default for site-specific requirements.

3.4 DEMONSTRATION AND TRAINING

A. The power monitor supplier shall offer field demonstration services to on-site personnel which include the following:

1. A review of the power monitor operation and maintenance manual shall be provided by a qualified manufacturer's

representative.

2. A hands-on demonstration of the as-installed power monitor shall be performed.

END OF SECTION

SECTION 16300
AUTOMATIC TRANSFER SWITCHES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, Greenbook, Whitebook, and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes transfer switches rated 600 V and less, including the following:

1. Automatic transfer switches
2. Bypass/isolation switches
3. Remote annunciation systems

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, weights, operating characteristics, furnished specialties, and accessories.

1. Technical data on all major components of all transfer switches and other products described in this section. Data is required for the transfer switch mechanism, control system, cabinet, and protective devices specifically listed for use with each transfer switch. Include steady state and fault current ratings, weights, operating characteristics, and furnished specialties and accessories.
2. Single-Line Diagram: Show connections between transfer switch, bypass/isolation switch, power sources, and load; and show interlocking provisions for each combined transfer switch and bypass/isolation switch.

B. Shop Drawings: Dimensioned plans, elevations, sections, and details showing minimum clearances, conductor entry provisions, gutter space, installed features and devices, and material lists for each switch specified.

1. Dimensioned outline drawings of assembly, including elevations, sections, and details including minimal clearances, conductor entry provisions, gutter space, installed features and devices and material lists for each switch specified.
2. Internal electrical wiring and control drawings.
3. Interconnection wiring diagrams, showing recommended conduit runs and point-to-point terminal connections to generator set.
4. Installation and mounting instructions, including information for proper installation of equipment to meet seismic requirements.

C. Manufacturer and Supplier Qualification Data

1. The transfer switch manufacturer shall be certified to ISO 9001 International Quality Standard and shall have third party certification verifying quality assurance in design/development, production, installation, and service, in accordance with ISO 9001.

2. The manufacturer of this equipment shall have produced similar equipment for a minimum period of 10 years. When requested, an acceptable list of installations with similar equipment shall be provided demonstrating compliance with this requirement.

D. Operation and Maintenance Data: For each type of product to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 01730 *Operation and Maintenance Data*, include the following:

1. Features and operating sequences, both automatic and manual.

2. List of all factory settings of relays, timers and protective devices; provide setting and calibration instructions where applicable.

E. Warranty documents demonstrating compliance with the project's contract requirements.

1.4 QUALITY ASSURANCE

A. Only approved bidders shall supply equipment provided under this contract.

B. Manufacturer Qualifications: The equipment supplier shall maintain a service center capable of providing training, parts, maintenance and emergency repairs to equipment, including transfer switch generator sets and remote monitoring equipment (if applicable) at the site within a response period of less than (eight hours or appropriate time period designated for Project) from time of notification.

1. The transfer switch shall be serviced by technicians employed by, and specially trained and certified by, the generator set supplier and the supplier shall have a service organization that is factory-certified in both generator set and transfer switch service. The supplier shall maintain an inventory of critical replacement parts at the local service organization, and in service vehicles. The service organization shall be on call 24 hours per day, 365 days per year.

2. Submit names, experience level, training certifications, and locations for technicians that will be responsible for servicing equipment at this site.

3. The manufacturer shall maintain model and serial number records of each transfer switch provided for at least 20 years.

C. Source Limitations: All transfer switches are to be obtained through one source from a single manufacturer. The generator set manufacturer shall warrant transfer switches to provide a single source of responsibility for products provided.

D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked as suitable for use in emergency, legally required or optional standby use as appropriate for the connected load.

E. The automatic transfer switch installation and application shall conform to the requirements of the following codes and standards:

1. Transfer switches and enclosures shall be UL 1008 listed and labeled as suitable for use in emergency, legally required, and optional standby applications.

2. CSA 282, Emergency Electrical Power Supply for Buildings, and CSA C22.2, No. 14-M91 Industrial Control Equipment

3. NFPA 70, National Electrical Code. Equipment shall be suitable for use in systems in compliance with Articles 700, 701 and 702.

4. Comply with NEMA ICS 10-1993 AC Automatic Transfer Switches

5. IEEE 446 – Recommended Practice for Emergency and Standby Power Systems for Commercial and Industrial Applications

6. EN55011, Class B Radiated Emissions and Class B Conducted Emissions

7. IEC 1000-4-5 (EN 61000-4-5); AC Surge Immunity

8. IEC 1000-4-4 (EN 61000-4-4) Fast Transients Immunity

9. IEC 1000-4-2 (EN 61000-4-2) Electrostatic Discharge Immunity

10. IEC 1000-4-3 (EN 61000-4-3) Radiated Field Immunity

11. IEC 1000-4-6 Conducted Field Immunity

12. IEC 1000-4-11 Voltage Dip Immunity

13. IEEE 62.41, AC Voltage Surge Immunity

14. IEEE 62.45, AC Voltage Surge Testing

F. Comply with NFPA 99 – Essential Electrical Systems for Healthcare Facilities

G. Comply with NFPA 110 – Emergency and Standby Power Systems. The transfer switch shall meet all requirements for Level 1 systems, regardless of the actual circuit level.

H. The manufacturer shall warrant the material and workmanship of the transfer switch equipment for a minimum of two (2) year from the warranty start date. The warranty start date is the date of registered commissioning and start up or eighteen (18) months from date of shipment, whichever is sooner.

I. The warranty shall be comprehensive. No deductibles shall be allowed for travel time, service hours, repair parts cost, and etc. during the minimum noted warranty period described above.

1.5 PROJECT CONDITIONS

A. Interruption of Existing Electrical Service: Do not interrupt electrical service to facilities occupied by City or others unless permitted under the following conditions and then only after arranging to provide temporary electrical service:

1. Notify (Architect/Resident Engineer/City) no fewer than 14 days in advance of proposed interruption of electrical service.

2. Do not proceed with interruption of electrical service without (Architect/ Resident Engineer/City's) written permission.

3. Do not energize any new service or distribution equipment without notification and permission of the (Architect/ Resident Engineer/City).

1.6 COORDINATION

A. Size and location of concrete bases and anchor bolt inserts shall be coordinated. Concrete, reinforcement and formwork must meet the requirements specified in Division 03. Anchor bolts shall meet requirements of Section 05550 *Anchorage in Concrete and Masonry*. See section "INSTALLATION" for additional information on installation

B. If Project calls for bypass switch(es) mounted on a concrete base, the base must be designed to accommodate the requirements of the drawout mechanism (extension rails and/or wheeled carriage) of the bypass switch.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Automatic Switch Company (ASCO)

B. Equipment specifications for this Project are based on automatic transfer switches manufactured by ASCO. Switches manufactured by other manufacturers that meet the requirement of this specification are acceptable, if approved not less than two weeks before scheduled bid date. Proposals must include a line-by-line compliance statement based on this specification.

C. Transfer switches utilizing molded case circuit breakers do not meet the requirements of this specification and will not be accepted.

2.2 GENERAL TRANSFER-SWITCH PRODUCT REQUIREMENTS

A. Provide transfer switches in the number and ratings that are shown on the drawings.

B. Indicated Current Ratings: Apply as defined in UL 1008 for continuous loading and total system transfer.

C. Fault-Current Closing and Withstand Ratings: UL 1008 WCR ratings must be specifically listed as meeting the requirements for use with protective devices at installation locations, under specified fault conditions. Withstand and closing ratings shall be based on use of the same set of contacts for the withstand test and the closing test.

D. Solid-State Controls: All settings should be accurate to +/- 2% or better over an operating temperature range of - 40 to + 60 degrees C (- 40 to + 140 degrees F).

E. Resistance to Damage by Voltage Transients: Components shall meet or exceed voltage-surge withstand capability requirements when tested according to IEEE C62.41. Components shall meet or exceed voltage-impulse withstand test of NEMA ICS 1.

F. Electrical Operation: Accomplished by a non-fused, momentarily energized solenoid or electric motor operator mechanism, mechanically and electrically interlocked in both directions (except that mechanical interlock is not required for closed transition switches).

G. Switch Characteristics: Designed for continuous-duty repetitive transfer of full-rated current between active power sources.

1. Switches using molded-case switches or circuit breakers, or insulated case circuit breaker components are not acceptable.

2. Transfer switches shall be double-throw, electrically and mechanically interlocked, and mechanically held in the Source 1 and Source 2 positions.

3. Main switch contacts shall be high pressure silver alloy. Contact assemblies shall have arc chutes for positive arc extinguishing. Arc chutes shall have insulating covers to prevent inter-phase flashover.

4. Contacts shall be operated by a high-speed electrical mechanism that causes contacts to open or close within three electrical cycles from signal.

5. The power transfer mechanism shall include provisions for manual operation under load with the enclosure door closed. Manual operation may be electromechanical or mechanical, but must be coordinated with control function.

6. Transfer switch shall be provided with flame retardant transparent covers to allow viewing of switch contact operation but prevent direct contact with components that could be operating at line voltage levels.

7. The transfer switch shall include the mechanical and control provisions necessary to allow the device to be field-configured for operating speed. Transfer switch operation with motor loads shall be as is recommended in NEMA MG1.

   a. Phase angle monitoring/timing equipment is not an acceptable substitute for this functionality

8. Transfer switches designated on the drawings as "3-pole" shall have a full current-rated neutral bar with lugs.

9. Transfer switches designated on the drawings as "isolation-bypass" switches shall meet the requirements of section "BYPASS/ISOLATION SWITCHES" of this specification.

H. Control: Transfer switch control shall be capable of communicating with the genset control, other switches and remote programming devices over a high-speed network interface.

I. Factory wiring: Transfer switch internal wiring shall be composed of pre-manufactured harnesses that are permanently marked for source and destination. Harnesses shall be connected to the control system by means of locking disconnect plug(s), to allow the control system to be easily disconnected and serviced without disconnecting power from the transfer switch mechanism

J. Terminals: Terminals shall be pressure type and appropriate for all field wiring. Control wiring shall be equipped with suitable lugs, for connection to terminal strips.

K. Enclosures: All enclosures shall be third-party certified for compliance to NEMA ICS 6 and UL 508, unless otherwise indicated:

1. The enclosure shall provide wire bend space in compliance to the latest version of NFPA70, regardless of the direction from which the conduit enters the enclosure.

2. Exterior cabinet doors shall provide complete protection for the system's internal components. Doors must have permanently mounted key-type latches. Bolted covers or doors are not acceptable.

3. Transfer switches shall be provided in enclosures that are third party certified for their intended environment per NEMA requirements.

2.3 AUTOMATIC TRANSFER SWITCHES

A. Comply with requirements for Level 1 equipment according to NFPA 110.

B. Indicated current ratings:

1. Refer to the Project drawings for specifications on the sizes and types of transfer switch equipment, withstand and closing ratings, number of poles, voltage and ampere ratings, enclosure type, and accessories.

2. Main contacts shall be rated for 600 VAC minimum.

a. Transfer switches shall be rated to carry 100% of rated current continuously in the enclosure supplied, in ambient temperatures of -40 to +60 degrees C (-40 to +140 degrees F), relative humidity up to 95% (non-condensing), and altitudes up to 10,000 feet (3000 meters).

C. Manual Switch Operation: The power transfer mechanism shall include provisions for manual operation under load with the enclosure door closed. Manual operation may be electromechanical or mechanical, but must be coordinated with control function

D. Relay Signal: Control shall include provisions for addition of a pre-transfer relay signal, adjustable from 0 to 60 seconds, to be provided if necessary for elevator operation, based on equipment provided for the project.

E. Control: Transfer switch control shall be provided with necessary equipment and software to communicate with the genset control, other transfer switches, remote annunciation equipment, and other devices over a high speed control network.

F. Transfer switches that are designated on the drawings as 3-pole shall be provided with a neutral bus and lugs. The neutral bus shall be sized to carry 100% of the current designated on the switch rating.

G. Automatic Transfer Switch Control Features

1. The transfer switch control system shall be configurable in the field for any operating voltage level up to 600 VAC. Voltage sensing shall be monitored based on the normal voltage at the site. Systems that utilize voltage monitoring based on standard voltage conditions that are not field configurable are not acceptable.

2. All transfer switch sensing shall be configurable from an operator panel or from a Windows XP or later PC-based service tool. Designs utilizing DIP switches or other electromechanical devices are not acceptable.

3. The transfer switch shall provide a relay contact signal prior to transfer or re-transfer. The time period before and after transfer shall be adjustable in a range of 0 to 60 seconds.

4. The control system shall be designed and prototype tested for operation in ambient temperatures from - 40 degrees C to + 60 degrees C (- 40 to +140 degrees F). It shall be designed and tested to comply with the requirements of the noted voltage and RFI/EMI standards.

5. The control shall have optically isolated logic inputs, high isolation transformers for AC inputs and relays on all outputs, to provide optimum protection from line voltage surges, RFI and EMI.

6. The transfer switch network monitoring equipment, when supplied, shall be provided with a battery-based auxiliary power supply to allow monitoring of the transfer switch when both AC power sources are non-operational.

H. Transfer Switch Control Panel: The transfer switch shall have a microprocessor-based control with a sealed membrane panel incorporating pushbuttons for operator-controlled functions, and LED lamps for system status indicators. The panel shall also include an alphanumeric display for detailed system information. Panel display and indicating lamps shall include permanent labels.

1. The indicator panel LEDs shall display:

   a. Which source the load is connected to (Source 1 or Source 2)

   b. Which source or sources are available

   c. When switch is not set for automatic operation, the control is disabled or the bypass switch is in use

   d. When the switch is in test/exercise mode

2. The indicator shall have pushbuttons that allow the operator to activate the following functions:

   a. Activate pre-programmed test sequence

b. Override programmed delays, and immediately go to the next operation

c. Reset the control by clearing any faults

d. Test all of the LEDs by lighting them simultaneously

3. The alphanumeric digital display shall be vacuum fluorescent-type, clearly visible in both bright sunlight and no-light conditions over an angle of 120 degrees, and shall display the following:

a. AC voltage for all phases, normal and emergency

b. Source status: connected or not connected.

4. The display panel shall be password-protected, and allow the operator to view and make adjustments:

a. Set nominal voltage and frequency for the transfer switch

b. Adjust voltage and frequency sensor operation set points

c. Set up time clock functions

d. Set up load sequence functions

e. Enable or disable control functions including program transition

f. View real-time clock data, operation log (hours connected, times transferred, failures) and service history

I. Control Functions: Functions managed by the control shall include:

1. Software adjustable time delays:

a. Engine start (prevents nuisance genset starts in the event of momentary power fluctuation): 0 to 120 seconds (default 3 sec)

b. Transfer normal to emergency (allows genset to stabilize before load is transferred): 0 to 120 seconds (default 3 sec)

c. Re-transfer emergency to normal (allows utility to stabilize before load is transferred from genset): 0 to 30 minutes (default 3 sec)

d. Engine cooldown: 0 to 30 minutes (default 10 min)

e. Programmed transition: 0 to 60 seconds (default 3 sec)

2. Undervoltage sensing: three-phase normal, three-phase emergency source.

3. Over-voltage sensing: three-phase normal, three-phase emergency source.

4. Over/under frequency sensing:

a. Pickup: +/- 5 to +/-20% of nominal frequency (default 10%)

b. Dropout: +/-1% beyond pickup (default 1%)

c. Dropout time delay: 0.1 to 15.0 seconds (default 5 sec)

d. Accurate to within +/- 0.05 Hz

5. Voltage imbalance sensing:
    a. Dropout: 2 to 10% (default 4%)
    b. Pickup: 90% of dropout
    c. Time delay: 2.0 to 20 seconds (default 5 sec)
6. Phase rotation sensing:
    a. Time delay: 100 msec
7. Loss of single-phase detection:
    a. Time delay: 100 msec

J. Control features shall include:

1. Programmable genset exerciser: A field-programmable control shall periodically start and run the generator with or without transferring the load for a preset time period, then re-transfer and shut down the generator after a preset cool-down period.
2. In event of a loss of power to the control, all control settings, real-time clock setting and the engine start-time delay setting will be retained.
3. The system continuously logs information including the number of hours each source has been connected to the load, the number of times transferred, and the total number of times each source has failed. An event recorder stores information, including time and date-stamp, for up to 50 events.
4. Re-Transfer Inhibit Switch: Inhibits automatic re-transfer control so automatic transfer switch will remain connected to emergency power source as long as it is available regardless of condition of normal source.
5. Transfer Inhibit Switch: Inhibits automatic transfer control so automatic transfer switch will remain connected to normal power source regardless of condition of emergency source.

K. Control Interface

1. Provide one set Form C auxiliary contacts on both sides, operated by transfer switch position, rated 10 amps 250 VAC.
2. Unassigned Auxiliary Contacts: Two normally open, 1-pole, double-throw contacts for each switch position, rated 10A at 240 VAC.

L. Engine Starting Contacts

1. One isolated and normally closed pair of contacts rated 10A at 32 VDC minimum.

2.4 BYPASS/ISOLATION SWITCHES

A. Comply with requirements for Level 1 equipment according to NFPA 110.

B. Description: Transfer switches that are designated on the drawings as "bypass isolation" transfer switches shall be provided with a manually-operated bypass switch arranged to select and connect either source of power directly to load, isolating transfer switch from load and from both power sources. Include the following features for each combined automatic transfer switch and bypass/isolation switch:

1. The bypass switch shall be enclosed in the same cabinet as the automatic transfer switch, and UL-listed as an assembled product.

2. The bypass isolation switch shall provide a means for manually bypassing the transfer switch from either source (Normal or Emergency) to the load, while under load if necessary, and to isolate the transfer switch from both sources for maintenance or repair without a power interruption or disturbance.

3. Designs that bypass to only one source are not acceptable under this specification.

4. The bypass switch shall be operable without the use of tools, and shall include the ability to isolate the automatic switch mechanism without the use of tools and without opening the exterior cabinet door(s).

5. Operability: Switch shall be constructed so load bypass and transfer-switch isolation can be performed by one person in no more than two operations, in 15 seconds or less.

6. Bypass isolation switch equipment shall be UL listed per Standard 1008 and CSA approved, with continuous current rating, voltage and frequency ratings, and withstand and closing ratings equal to the transfer switch ratings at the specified conditions of ambient temperature, humidity, and altitude.

7. The bypass isolation and transfer switches shall be mechanically held in each position. Switching mechanisms shall be break-before-make on all poles, including the neutral pole on 4-pole switches except where closed transition transfer is specified as defined in section "CLOSED-TRANSITION TRANSFER SWITCHES". The switch mechanism shall be an over-center toggle device which provides stored energy contact operation during both opening and closing. The speed of contact operation shall be independent of the force applied to the operating handles, which permit manual operation under load.

8. Provide means to lock bypass/isolation switch in the position that isolates transfer switch with an arrangement that permits complete electrical testing of transfer switch while isolated. While isolated, interlocks shall prevent transfer-switch operation, except for testing or maintenance.

9. Bypass switch shall be a fully-rated, manually-operated switch, rated for the same loads as the automatic transfer switch. Bypass switch shall provide bypass to either normal or emergency source by use of a door mounted, keyed source selector switch and a permanently mounted external operating handle. Equipment shall provide manual bypass without disturbance of the power supply to the load.

a. Equipment requiring load isolation before bypass is not acceptable for use on this Project.

10. Maintainability: Fabricate to allow convenient removal of major components from front without removing other parts or main power conductors.

11. Contact temperatures of bypass/isolation switches shall not exceed those of automatic transfer-switch contacts when they are carrying rated load.

12. Positive mechanical interlocks shall prevent all possible source-to-source interconnections via the bypass switch. The interlock system shall assure a properly sequenced, mechanically guided bypass and isolation action.

    a. Designs which depend on electrical interlocks to prevent source to source interconnections, or which intentionally interconnect the sources via the bypass switch, are not acceptable.

13. The equipment shall utilize automatic, mechanical stops to prevent manually bypassing to a dead source.

    a. Equipment that does not prevent dead source bypass is not acceptable.

14. A drawout isolation mechanism shall provide closed-door isolation of the transfer switch. The isolation mechanism shall be interlocked so that either the transfer switch must be bypassed or the transfer switch must be open before the mechanism will permit isolation of the transfer switch. Drawout arrangement must provide physical separation from live parts and accessibility for testing and maintenance operations.

15. The isolation mechanism shall provide for three-position operation: Connected, Test, and Isolated. In the Connected position, isolation contacts shall be fully engaged and closed, with the transfer switch control cable connected. In the Test position, isolation contacts shall be open and the transfer switch control cable connected. The Test position shall allow operational testing of transfer switchs and controls without power disruption to the load. In the Isolated position, the transfer switch and control shall be completely isolated from all power sources. In the Isolated position, the transfer switch shall be capable of being withdrawn from the cabinet.

16. The bypass and isolation process for the automatic transfer switch shall be capable of being fully accomplished without opening the cabinet door.

17. Interconnection of bypass/isolation switch with automatic transfer switch shall consist of factory-installed copper bus bars, plated at connection points and braced for the indicated available short-circuit current.

18. Note the size and access requirements for the transfer switch with bypass isolation and provide equipment that will fit into the space allowed as well as complying with code-specified access requirements.

19. Manufacturer's standard legend for control labels and instruction signs shall describe operating instructions.

C. Interconnection of Bypass/Isolation Switches with Automatic Transfer Switches: Factory-installed copper bus bars, plated at connection points and braced for the indicated available short-circuit current.

2.5 REMOTE ANNUNCIATOR SYSTEM

A. Functional Description: Remote annunciator panel shall annunciate conditions for indicated transfer switches. Annunciation shall include the following:

1. Sources available, as defined by actual pickup and dropout settings of transfer-switch controls.
2. Switch position.
3. Switch in test mode.
4. Failure of communication link.

B. Annunciator Panel: LED-lamp type with audible signal and silencing switch.

1. Indicating Lights: Grouped for each transfer switch monitored.
2. Label each group, indicating transfer switch it monitors, location of switch, and identity of load it serves.
3. Switch in test mode.
4. Lamp Test: Push-to-test or lamp-test switch on front panel.

C. Malfunction of annunciator or communication link shall not affect functions of automatic transfer switch. In the event of failure of communication link, automatic transfer switch automatically reverts to stand-alone, self-contained operation.

D. Automatic transfer-switch sensing, controlling, or operating function shall not depend on remote panel for proper operation. The remote annunciation system shall not prevent transfer to the alternate source when the primary power source fails, nor prevent return to the primary source if the alternate source fails

PART 3 EXECUTION

3.1 INSTALLATION

A. Design each fastener and support to carry load indicated by seismic requirements and according to seismic-restraint details. See Section 16050, *Basic Electrical Materials and Methods.*

B. Floor-Mounting Switch: Anchor to floor by bolting.

1. Floor-mounted transfer switches (except drawout switches supported by wheeled carriages, which must be rolled out at floor level) shall be mounted on concrete bases complying with the following requirements:
   a. Concrete Bases: 4 inches (100 mm) high, reinforced, with chamfered edges. Extend base no more than 4 inches (100 mm) in all directions beyond the maximum dimensions of switch, unless otherwise indicated or unless required for seismic support.

Construct concrete bases according to Section 16050, *Basic Electrical Materials and Methods*.

C. Annunciator Panel Mounting: Flush in wall, unless otherwise indicated.

D. Identify components according to Section 16050, *Basic Electrical Materials and Methods*.

E. Set field-adjustable intervals and delays, relays, and engine exerciser clock.

3.2 CONNECTIONS

A. Wiring to Remote Components: Match type and number of cables and conductors to control and communication requirements of transfer switches as recommended by manufacturer. Increase raceway sizes at no additional cost to City if necessary to accommodate required wiring.

B. Field control connections shall be made on a common terminal block that is clearly and permanently labeled.

C. Transfer switch shall be provided with AL/CU mechanical lugs sized to accept the full output rating of the switch. Lugs shall be suitable for the number and size of conductors shown on the drawings.

D. Ground equipment according to Section 16050, *Basic Electrical Materials and Methods*.

E. Connect wiring according to Section 16050, *Basic Electrical Materials and Methods*.

3.3 SOURCE QUALITY CONTROL

A. Prior to shipping, factory shall test and inspect components, assembled switches, and associated equipment to ensure proper operation.

B. Factory shall check transfer time and voltage, frequency, and time-delay settings for compliance with specified requirements.

C. Factory shall perform dielectric strength test complying with NEMA ICS 1.

3.4 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: The supplier of the transfer switch(es) and associated equipment shall inspect, test, and adjust components, assemblies, and equipment installations, including connections, and report results in writing.

B. Manufacturer's representative shall perform tests and inspections and prepare test reports.

C. After installing equipment and after electrical circuitry has been energized, installer shall test for compliance with requirements.

1. Perform recommended installation tests as recommended in manufacturer's installation and service manuals.

2. After energizing circuits, demonstrate interlocking sequence and operational function for each switch.

a. Simulate power failures of normal source to automatic transfer switches and of emergency source with normal source available.

b. Verify time-delay settings.

c. Verify that the transfer switch is accurately metering AC voltage.

d. Test bypass/isolation unit functional modes and related automatic transfer-switch operations.

e. Verify proper sequence and correct timing of automatic engine starting, transfer time delay, retransfer time delay on restoration of normal power, and engine cool-down and shutdown.

D. Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each switch. Remove all access panels so joints and connections are accessible to portable scanner.

1. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each switch 11 months after date of Substantial Completion.

2. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.

3. Record of Infrared Scanning: Prepare a certified report that identifies switches checked and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.5 DEMONSTRATION

A. After generator set installation, the generator and transfer switch supplier shall conduct a complete operation, basic maintenance, and emergency service seminar covering generator set and transfer switch equipment, for up to 10 people employed by the City.

1. The seminar shall include instruction on operation of the transfer equipment, normal testing and exercise, adjustments to the control system, use of the PC based service and maintenance tools provided under this contract, and emergency operation procedures.

2. The class duration shall be at least 8 hours in length, and include practical operation with the installed equipment.

3.6 SERVICE AND SUPPORT

A. The manufacturer shall supply the Service Provider with a complete set of the service and maintenance software required to support the product. The software shall be provided at a training class attended by the user, to qualify the user in proper use of the software. The software shall have the following features and capabilities:

1. The software shall allow adjustment of all functions described herein, adjustment of operating levels of all protective functions, and programming of all optional functions in the controller. Adjustments shall

H. Locate the pressure tap for head measurement not less than 10 pipe diameters downstream from the discharge elbow of the test pump.

I. Should results of the full-scale tests indicate, in the opinion of the City's Representative, that the pumps will fail to meet any of the specified requirements, the City's Representative will notify the Contractor of such failure. The manufacturer shall thereupon, at no expense to the City, make such modifications and perform additional tests as may be necessary to comply with these specifications.

3.05 PAINTING AND COATING

A. Line and coat interiors and exteriors of pump columns, discharge heads, with fusion-bonded epoxy per Specification Section 09961, Fusion Bonded Epoxy Coatings and Linings". Apply coating at factory.

B. Coat interior and exterior of bowl assemblies and interior and exterior of suction bell with fusion bonded epoxy per Specification Section 09961, Fusion Bonded Epoxy Coatings and Linings".

C. Surface preparation and pump coatings, including pump cans and pump bowl internal surfaces and passages, shall be inspected and tested by a City representative. The coating test shall occur at the coating shop prior to pump assembly and after machining or trimming of impellers. Contractor shall assume two separate trips for inspection, one for the pump materials prior to assembly and one for the pump barrel prior to shipment and shall include all costs associated with coating inspections in the original bid. Contractor is required to coordinate the coating inspection(s) with the City and coating applicator(s). In the event of test failure, the Contractor shall provide at his expense additional budget allowing the City Representatives to re-inspect coatings as required until approval is granted by the City. For facilities located farther than 200 miles from the project site, the costs shall include reimbursement for air transportation, car rental, and meals. If overnight stay is required, include the cost of a hotel room. No additional compensation will be due to the Contractor for initial or subsequent coating inspection tests.

3.06 SHIPMENT AND STORAGE

A. Prepare equipment and motors for shipment including blocking of the rotor when necessary. Identify blocked rotors by means of corrosion-resistant tags attached with stainless steel wire. The preparation shall make the equipment suitable for six months of outdoor storage from the time of shipment, with no disassembly required before operation, except for inspection of bearings and seals.

B. Identify the equipment and motors with item and serial numbers and project equipment tag numbers. Material shipped separately shall be identified with securely affixed, corrosion-resistant metal tags indicating the item and serial number and project equipment tag numbers of the equipment for which it is intended. In addition, ship crated equipment with duplicate packing lists, one inside and one on the outside of the shipping container.

C. Equipment and motors shall be fully covered with an acceptable cover prior to and throughout the entire duration of the delivery process. The cover shall be adequately designed to protect the equipment from wind, dust, and moisture. The pump supplier shall take photographs of the pump equipment and protective covering prior to departure from the pump facility. The photographs shall be submitted to the City.

D. Pack and ship one copy of the manufacturer's standard installation instructions with the equipment. Provide the instructions necessary to preserve the integrity of the storage preparation after the equipment arrives at the jobsite and before start-up.

E. Store and protect pumps per API 686 (first edition), Chapter 3, paragraphs 1.4 through 1.9, 1.15, 1.17, 1.20, and 1.21 and as described below.

F. Coat exterior machined surfaces with a rust preventative.

G. Provide flanged openings with metal closures at least 3/16-inch thick, with elastomer gaskets and at least four full-diameter bolts. Install closures at place of pump manufacture prior to shipping. For studded openings, use all the nuts needed for the intended service to secure closures.

H. Provide threaded openings with steel caps or solid-shank steel plugs. Do not use nonmetallic (such as plastic) plugs or caps. Install plugs at place of pump manufacture prior to shipping.

I. Clearly identify lifting points and lifting lugs on the equipment or equipment package. Identify the recommended lifting arrangement on boxed equipment.

J. Wrap exposed shafts and shaft couplings with waterproof, moldable waxed cloth or volatile-corrosion-inhibitor paper. Seal the seams with oil-proof adhesive tape.

K. If electric motors are stored or installed outside or in areas subject to temperatures below 40°F or are exposed to the weather prior to permanent installation, provide the manufacturer's recommended procedures for extended storage. Provide temporary covers over the motor electrical components. Provide temporary conduits, wiring, and electrical supply to space heaters. Inspect electrical contacts before start-up.

3.07 PUMP INSTALLATION

A. Install equipment horizontal and vertical according to the manufacturer's written instructions and the contract documents. Confirm that pump cans and pumps are set to meet the vertical alignment requirements established by the manufacturer. Using the machinist's level check all the way across the opening of the mounting flange at 90 degree increments. Pump can mounting flange should be set level and within the pump manufacturer's allowable tolerance. If required, machine can flange to achieve specified levelness prior to pump installation. All costs associated with setting the pump can flange shall be borne by the Contractor and included in

the Contractor's original bid price; no additional compensation will be due to the Contractor.

B. Prior to setting pumps, Contractor shall provide written certification from the pump manufacturer that the vertical and horizontal alignments of the pump can mounting flange are acceptable.

C. Provide the manufacturer's recommended lubricants and operating fluids and verify that each piece of equipment contains the amount recommended by the manufacturer.

D. Provide threaded caps for protection of nuts and bolt threads on the bolts and nuts of the column pipe flanges and bowl flanges.

E. Verify that the installed pump is fully self-supporting before bolting pipe flanges, so that no strain is imparted on the flanges, pipes, or pipe supports from the pump assembly. Do not use temporary shims or jacking nuts for leveling, aligning, or supporting equipment. Pipe strain shall be measured to confirm the discharge piping does not move the pump more than 0.002 inches when the pipe is bolted up.

F. Provide final grouting of the pump assembly base according to Specification Section 03600, "Grout".

G. Provide continuous protection of the installed equipment from the elements, dust, debris, paint spatter, or other conditions that will adversely affect the unit's operation until such time as the equipment is scheduled for start-up testing.

3.08 MOUNTING AND ALIGNMENT OF VERTICAL SOLID SHAFT DRIVERS

A. Before mounting the driver on the discharge head/driver stand, check the register fit, if furnished, and the mounting face on the driver for acceptable tolerance on runout and squareness, respectively, using a dial indicator mounted on the driver shaft. See ANSI/NEMA MG-1. Next, check the squareness of the face of the driver coupling half, mounted on the shaft with a tight fit and seated against a split ring, using a dial indicator on a firm base.

B. With the driver bolted to the discharge head, mount a dial indicator on the driver shaft above the coupling half and check for proper alignment in conformance with the manufacturer's tolerances. As directed by the manufacturer's representative, some adjustment can be made at the driver mounting fit and the stuffing box mounting fit. Before installing any additional coupling parts, check the driver for correct rotation, as given in the manufacturer's installation instructions.

C. Next, mount the pump half coupling, shaft adjusting nut, and coupling spacer if applicable, and raise the impeller in accordance with the manufacturer's instructions. Then secure the coupling bolts. Make a final check of the shaft runout below the pump half coupling with a dial indicator. If the runout is within manufacturer's acceptable tolerances, check the tightness of the driver hold-down bolts. If dowels are used to secure the driver location, then redoweling is required

after disassembly/reassembly, since tolerance buildup in the multiple vertical joints results in alignment variation.

3.09 FIELD TESTING

A. Bump motor to ensure that motor has been connected for proper rotation prior to coupling pump.

B. Perform field tests for four consecutive hours on each pump. Measure flows at the following head points:

Tag Numbers	Test Points
P- 01, P- 02 and P- 03	150, 123, and 100
P- 04, P- 05 and P- 06	150, 123, and 100

C. If the measured flows at the above-tabulated pump heads are more than 5% below the flows obtained from the laboratory or factory test, provide new impellers or otherwise repair or replace the pumps or calibrate meters and/or pressure gauges. Such adjustments will be included in the Contractor's original bid price, and no additional cost will be paid by the City to achieve the pump performance requirements indicated herein.

D. Conduct vibration level tests with pumps operating at their rated capacity. Adjust or replace pumps that exceed the maximum vibration levels.

E. Assure that in the automatic mode each pump responds to its start/stop signal.

F. Assure that limit switches on the pumps' control valves indicate and transmit the signals for the valves in the open and closed positions.

G. Demonstrate that the pumping units, drivers, and control system meet the following requirements:

1. The pumping units operate as specified without excessive noise (in excess of 103 decibels at 3-feet), cavitation, vibration, and without overheating of the bearings.

2. Automatic and manual controls function in accordance with the specified requirements.

3. Drive equipment operates without being overloaded.

END OF SECTION

SECTION 13110
GALVANIC ANODE CATHODIC PROTECTION

PART 1 GENERAL

1.01 WORK OF THIS SECTION

A. Furnish all labor, materials, tools and incidentals to install a galvanic anode cathodic protection system for the City of San Diego's 69th Street Mohawk Pump Station Dielectrically Coated Steel Pipeline. Cathodic protection installation, inspection, and testing are required for a complete and workable system.

B. The CONTRACTOR shall retain a qualified CORROSION ENGINEER to direct the construction of facilities specified herein. The CORROSION ENGINEER shall test and certify that the corrosion control facilities for this project are constructed properly and as specified, and are fully functional.

1.02 DEFINITIONS

A. CONTRACTOR: The licensed prime installer selected by the OWNER to install the pipeline.

B. OWNER: The City of San Diego.

C. CORROSION ENGINEER: A qualified CORROSION ENGINEER retained by the CONTRACTOR who is either a Registered Professional CORROSION ENGINEER or NACE-International Certified CATHODIC PROTECTION SPECIALIST.

D. ENGINEER: The City of San Diego's Resident ENGINEER or designated representative.

E. CITY'S CORROSION ENGINEER: The ENGINEER'S appointed representative from the City's Corrosion Section.

1.03 CONTRACTOR QUALIFICATIONS

A. All work must be conducted by qualified, experienced personnel working under the direct supervision of a CORROSION ENGINEER. The CONTRACTOR doing the electrical installations shall have proper valid State of California licenses.

1.04 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

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

C94	Ready-Mixed Concrete
D-2220	Polyvinylchloride Insulation for Wire and Cable
D-1248	Polyethylene Plastics Molding and Extrusion Materials
B3	Soft or Annealed Copper Wire
B8	Concentric-Lay Stranded Copper Conductors

B. Federal Specifications (FS)
Military Specification (Mil. Spec):

MIL-C-18480B Coating Compound, Bituminous, Solvent, Coal Tar Base

C. Underwriter's Laboratories, Inc. (UL) Publications:
83-80 Thermoplastic-Insulated Wires
486-76 Wire Connectors and Soldering Lugs for Use with Copper Conductors

D. National Association of Corrosion ENGINEERs (NACE):
SP0169 Recommended Practice, Control of External Corrosion on Underground or Submerged Metallic Piping Systems

SP0286 Electrical Isolation of Cathodically Protected Pipelines

1.05 CONTRACTOR SUBMITTALS

A. The CONTRACTOR shall furnish the following documents to the ENGINEER and the catalog cuts shall be accepted prior to installation:

B. CATALOG CUTS (5 COPIES):

1. Standard potential magnesium anode
2. At-grade, traffic-rated concrete test box with cast iron lid
3. Shunts
4. Wire and cable
5. Exothermic weld kits
6. Weld caps
7. Weld coating
8. Plastic warning tape
9. Flange Isolation kits
10. Wax tape coating system

C. AS-BUILT DRAWINGS

The CONTRACTOR shall maintain As-Built drawings showing exact locations of anodes, insulators, test stations, and wire trenching runs. Location changes from the design shall be clearly marked in red on a blue line copy of the design drawings. The As-Built drawings shall be submitted to the ENGINEER at the end of the project. The project is not considered complete until As-Built drawings are submitted.

D. CORROSION ENGINEERS QUALIFICATIONS

The CONTRACTOR must submit the CORROSION ENGINEER'S certifications and qualifications as part of the submittal package.

E. CORROSION ENGINEER'S REPORT

The CONTRACTOR shall submit the CORROSION ENGINEER'S report within 5 days after the final testing is completed for the project. See Part 4 - Testing. The Report shall be submitted in hard copy and electronic format. The electronic copy shall be digitally signed. The project is not considered complete until the report and test data are submitted.

PART 2 PRODUCTS

2.01 GENERAL

A. Materials and equipment shall be new and the standard product of manufacturers regularly engaged in the manufacturing of such products. All materials and equipment shall bear evidence of safe operation approval from a nationally recognized testing laboratory.

2.02 STANDARD POTENTIAL MAGNESIUM ANODES

A. CAPACITY. Standard potential magnesium anodes shall have a theoretical energy content of 1000 ampere-hours per pound and have a minimum useful output of 500 ampere-hours per pound.

B. CHEMICAL COMPOSITION (STANDARD POTENTIAL MAGNESIUM) ASTM B843

aluminum	5.3 to 6.7 percent
manganese	0.15 to 0.7 percent
zinc	2.5 to 3.5 percent
copper	0.02 percent max
nickel	0.002 percent max
iron	0.03 percent max
silicon	0.10 percent max
calcium	-
others, total	0.30 percent max
magnesium	remainder

C. OPEN CIRCUIT POTENTIAL. The open circuit potential of all anodes, buried in the soil, shall be between 1.52 and 1.60 volts dc versus a copper-copper sulfate reference electrode.

D. INGOT SIZE AND WEIGHT. Anodes shall be 17-pound pre-packaged, standard potential ingots with a trapezoidal cross section. Ingot length shall be 25.25 inches long. The total packaged weight shall be 45 lbs.

E. ANODE CONSTRUCTION. Anodes shall be cast magnesium with a galvanized steel core rod recessed on one end to provide access to the rod for connection of the lead wire. Silver braze the lead wire to the rod and make the connection mechanically secure. Insulate the connection to a 600 volt rating by filling the recess with epoxy and covering any exposed bare steel core or wire with heat shrinkable tubing. The insulating tubing shall extend over the lead wire insulation by not less than 1/2 inch. The anode lead wire shall be stranded copper and shall be connected directly to the anode steel core as described above. There shall be NO wire splices between the anode steel core and the tag end at the test station.

F. ANODE PRE-PACKAGED BACKFILL MATERIAL. The anodes shall be completely encased and centered within a permeable cloth bag in a special low resistivity backfill mix with the following composition:

Gypsum	75%
Powdered bentonite	20%
Anhydrous sodium sulfate	5%

G. Backfill grains shall be such that 100 percent is capable of passing through a screen of 100 mesh. Backfill shall be firmly packed around the anode such that the ingot is approximately in the center of the backfill. The resistivity of the backfill shall be no greater than 50 ohm-cm when tested wet in a soil box. Total prepackaged weight shall be approximately 45 pounds.

2.03 AT-GRADE TEST STATIONS

A. At-Grade (Flush) Mounted:

1. Test Box: Concrete box of dimensions as shown on the Drawings. Use pre-cast concrete San Diego Pre-cast Model 1BSD\K with cast iron lid. The cast iron lid shall be 9-1/2 inch diameter with the letters "City of San Diego Corrosion Test Station".

2. Identification Tags: All test leads shall be identified with an Avery Label, self-adhesive covered with polyolefin clear heat shrink tubing. The label shall include: Name of Facility – size – pipe material; Type of insulation; Station number. Brass tags may be used in lieu of the Avery Label with approval from the ENGINEER.

2.04 SHUNTS

A. Holloway Type RS, 0.01 ohm, 6 ampere capacity.

2.05 WIRES

A. General: Conform to applicable requirements of NEMA WC 5 and WC 7. All wires shall be single conductor, unless otherwise specified. All wires shall be single

conductor, stranded copper wire with 600-volt HMWPE insulation, unless otherwise specified.

B. Mechanical Joint (Non-Welded Pipe Joint) Bond: Two No. 2 AWG HMWPE.

C. Pipeline Test Leads: Two No. 8 AWG HMWPE.

D. Anode Wires: No. 12 AWG THWN with white insulation.

2.06 CONCRETE

A. Reinforcing steel: ASTM A 615, Grade 60 deformed bars and welded wire fabric.

B. Welded Wire Fabric: ASTM A 497.

C. Formwork: Plywood, earth cuts may be used.

D. Concrete Design for Minimum Compressive Strength at 28 Days.

2.07 ANCILLARY MATERIALS

A. Electrical Tape: Linerless rubber high-voltage splicing tape and vinyl electrical tape suitable for moist and wet environments. Use Scotch 130C and Scotch 88 as manufactured by 3M Products.

B. Wire Connectors: One-piece, tin-plated crimp-on lug connector as manufactured by Burndy Co., Thomas and Betts.

C. Insulating Resin: At CONTRACTOR'S option, bitumastic coating (Koppers 50 or approved equal) may be used if allowed to dry completely before covering.

2.08 MARKING TAPE

A. Inert polyethylene, impervious to known alkalis, acids, chemical reagents, and solvents likely to be encountered in soil.

B. Thickness: Minimum 4-mils.

C. Width: 6-inches.

D. Identifying Lettering: Minimum 1-inch high, permanent black lettering imprinted continuously over entire length.

E. Color: Red with black lettering as follows: "CAUTION CATHODIC PROTECTION CABLES BURIED BELOW."

2.09 EXOTHERMIC WELDS

A. General: Wire sleeves, welders, and weld cartridges according to the weld manufacturer's recommendations for each wire size and pipe or fitting size and

material. Welding materials and equipment shall be the product of a single manufacturer. Interchanging materials of different manufacturers will not be accepted.

B. Weld Caps: Exothermic welds shall be sealed with a pre-fabricated plastic cap filled with formable mastic compound on a base of elastomeric tape. Use Royston Handy Cap or approved equivalent. Primer for weld caps shall be Royston Roybond Primer 747 or approved equivalent.

C. Weld Coating: Exothermic welds and weld caps shall be coated with a cold-applied, fast-drying mastic consisting of bituminous resin and solvents per MIL-C-18480B. Use Carboline Bitumastic 50, Tnemec 40-H413, Tapecoat TC Mastic, 3M Scotch Clad 244, or approved equal. The minimum coating thickness shall be 25 mils (0.025 inch).

2.10 INSULATING JOINTS

A. Flange Isolation Kits:

1. Gaskets: ANSI B-16.21, Type E, NEMA G10 glass with o-ring seal for operation between 20-deg. F and 150-deg. F. Gaskets shall be suitable for the temperature and pressure rating of the piping system in which they are installed.

2. Insulating Sleeves: 1/32-inch thick tube, full length, G10 glass material per NEMA LI-1 for operation between 20-deg. F and 150-deg. F. For installation at threaded valve flanges, half-length sleeves shall be used.

3. Insulating Washers: 1/8-inch thick, full length, G10 glass per NEMA LI-1 for operation between 20-deg. F and 150-deg. F.

4. Steel Washers: 1/8-inch cadmium plated steel placed between the nut and insulating washer.

5. All buried insulating flanges shall be wax taped coated per AWWA C217 with plastic outer wrap.

2.11 EXTERNAL COATING FOR BURIED SURFACES

A. All buried pipe sections, specials, and fitting surfaces that are not tape wrapped or epoxy coated shall be wrapped with a petrolatum wax tape coating per AWWA C217 with plastic outer wrap. No bare metallic surfaces shall be buried, backfilled, or in contact with the soil.

1. Primer: All surfaces shall be prime coated with a blend of petrolatum, plasticizer, inert fillers, and corrosion inhibitors having a paste-like consistency.

2. Wax Tape: Covering material shall be a synthetic felt tape, saturated with a blend of petrolatum, plasticizers, and corrosion inhibitors that is formable over irregular surfaces.

3. Plastic Outer Wrap: The primed and wax taped surface shall be covered with a plastic outer wrap consisting of three layers of 50-guage (10-mil) polyvinylidene chloride or PVC, high cling membrane wound together.

PART 3 EXECUTION

3.01 GENERAL

A. STANDARD. Work not specifically described herein shall conform to NACE SP0169, NACE SP0286, and the Standard Specifications for Public Works Construction 2012 (Greenbook).

B. TEST RESULTS. The CONTRACTOR shall submit a CORROSION ENGINEER'S report including all test data, conclusions, repairs, and cathodic protection system performance.

C. NOTIFICATION FOR TESTING. The CONTRACTOR shall notify the ENGINEER at least seven days in advance of the anodes, insulators, and test station installations. The ENGINEER or the OWNER'S representative shall, at their discretion, witness the installation of all anodes and cathodic protection facilities. Testing shall be as described in this specification section.

3.02 MAGNESIUM ANODES

A. INSPECTION. All lead wires shall be inspected to ensure that the lead wire is securely connected to the anode core and that no damage has occurred to the lead wire. Lead wire failures shall require replacement of the complete anode and lead wire.

B. PRE-PACKAGED ANODE INSPECTION. Each anode shall be inspected to ensure that the backfill material completely surrounds the anode and that the cloth bag containing the anode and backfill material is intact. If the prepackaged anodes are supplied in a waterproof container or covering, that container or covering shall be removed before installation. The CONTRACTOR shall notify the ENGINEER at least seven (7) days in advance of installing the anodes.

C. LOCATION. Anodes are to be installed in augured holes as shown in the drawings. Anode positions can be adjusted slightly to avoid interference with existing structures. Alternate anode positions must be approved by the ENGINEER.

D. HANDLING. Care shall be taken to ensure that the anode is never lifted, supported, transported, or handled by the lead wire. All anodes shall be lowered into the hole using a sling or a rope.

E. ANODE HOLE SIZE AND DEPTH. Anodes shall be placed vertically at the bottom of a 12 feet deep augured hole, 12 inches in diameter (minimum).

F. SOAKING REQUIREMENTS, PRE-PACKAGED ANODES. Once the prepackaged anodes are in the hole, water shall be poured into the hole so that the anodes are completely covered with water. Allow the anodes to soak for a minimum of 30 minutes before any soil backfill is added.

G. SOIL BACKFILL. After the pre-packaged anodes are soaked, the hole is backfilled with stone-free, native soil. No voids shall exist around the anode bags and the anode lead wire shall not be damaged. The backfill shall be tamped and compacted in 18 inch lifts above the anode taking care not to damage the anode lead wire.

3.03 AT-GRADE TEST STATIONS

A. LOCATION. At-grade corrosion monitoring test boxes shall be located behind the curb or sidewalk and NOT in traffic lanes or gutters. All test box locations shall be approved by the ENGINEER.

B. TEST BOX BOTTOM. Test boxes shall be set in native soil.

C. TEST LEAD ATTACHMENT. Test leads shall be attached to the pipe using the exothermic weld process. An 18-inch length of slack wire shall be coiled at each weld and inside each test box.

D. CONCRETE PAD. A 24-inch square by 4-inch thick reinforced concrete pad is required around each at-grade test station. Test boxes and concrete pad shall be flush with the top of the median curb.

3.04 WIRE AND CABLE

A. TEST LEAD TRENCH. Horizontal test or anode lead runs shall be placed in a 36-inch trench.

B. WIRE HANDLING. Wire leads shall not be stretched or kinked. Care shall be taken when installing wire and backfilling. If wire insulation is damaged during installation, it shall be rejected and replaced completely at the CONTRACTOR's expense. All rejected wire shall be removed from the job site at the close of each workday.

C. PLASTIC WARNING TAPE. Plastic warning tape shall be installed in all wire trenches and 12 inches below finished grade.

D. SPLICING. Wire splices are not permitted.

3.05 WIRE-TO-PIPE CONNECTIONS

A. All connections of copper wires to the pipe shall be made by the exothermic weld method.

B. WELD CHARGE SIZE. It is the CONTRACTOR'S responsibility to ensure that the manufacturer's recommended weld charge size is used.

C. PREPARATION OF WIRE. Do not deform cable. Remove only enough insulation from the cable to allow for the exothermic weld.

D. PREPARATION OF METAL. Remove all coating, dirt, grime and grease from the metal structure by wire brushing. Clean the structure to a bright, shiny surface free of all serious pits and flaws by using a file. The surface area of the structure must be absolutely dry.

E. WIRE POSITION. The wire is to be held at a 30-degree angle to the surface when welding. Only one wire shall be attached with each weld.

F. TESTING OF ALL COMPLETED WELDS. After the weld has cooled, the weld shall be tested by striking the weld with a 2-lb hammer while pulling firmly on the wire. All unsound welds shall be cleaned, re-welded, and re-tested. All weld slag shall be removed.

G. COATING OF WELDS. The area to be coated shall be clean and completely dry. Apply a primer specifically intended for use with an elastomeric weld cap. Apply the weld cap and a bituminous mastic coating material to all exposed areas around the cap in accordance with the manufacturer's recommendations. The coating shall overlap the structure coating by a minimum of 3 inches.

H. COATING REPAIRS. Coatings shall be repaired in the field per the coating manufacturer's recommendations. All coating repairs must be approved by the ENGINEER.

3.06 BOND WIRES

A. NON-WELDED JOINT BOND WIRES. Two No. 2 HMWPE bond wires are required across each non-insulating, in-line valve; a third No. 4 HMWPE bond wire is required from the valve to one outside flange as shown in the drawings. The bond wires shall be attached using the exothermic weld process. Bond wires shall have some slack wire at each weld to allow for creep when backfilling.

3.07 FLANGE ISOLATION KITS

A. General: Flange isolation kits shall be pre-assembled and installed as recommended by the manufacturer, and per NACE SP0286. Moisture, soil, and other foreign matter must be fully removed and prevented from contacting any portion of mating surfaces. If foreign matter contacts any portion of these surfaces, then the entire flange shall be disassembled, cleaned, and dried before reassembly.

B. Installation: Align and install insulating joints according to the manufacturer's recommendations to avoid damaging insulating materials. The manufacturer's bolt tightening sequence and torque specifications shall be followed.

C. Paint Pigments: No electrically conductive pigments or paints shall be used either internally or externally on the bolts, washers, or flanges.

D. Inspection: All buried insulating flanges shall be inspected, tested, and approved by the ENGINEEER as described in Part 4 of this specification and prior to the application of wax tape coating.

3.08 EXTERNAL COATING

A. All insulating flanges shall be covered with a 3-layer wax tape coating system per AWWA C217 with plastic outer wrap. Additionally, all in-line valves, flanges couplings, and adapters that are not coated with a bonded dielectric coating shall be wax tape coated per AWWA C217 with plastic outer wrap.

B. Primer: Surfaces must be cleaned of all dirt, grime, and dust by using a wire brush and clean cloth. The surface shall be dry. Apply the primer by hand or brush. A thin coating of primer shall be applied to all surfaces and worked into all crevices. The primer shall be applied generously around bolts, nuts, and threads, and shall fully cover all exposed areas. The primer should overlap the pipe coating by a minimum of 3-inches.

C. Petrolatum Saturated Tape: The wax tape can be applied immediately after the primer. Short lengths of tape shall be cut and carefully molded around each individual bolt, nut, and stud end. For long bolts (such as in couplings), short lengths of tape shall be cut and circumferentially wrapped around each individual bolt. After the bolts are covered, the tape shall be circumferentially wrapped around the flange with sufficient tension to provide continuous adhesion without stretching the tape. The tape shall be formed, by hand, into all voids and spaces. There shall be no voids or gaps under the tape. The tape shall be applied with a 1-inch minimum overlap.

D. Outer Covering: A plastic outer cover shall be applied over the petrolatum-saturated tape. The plastic shall be a minimum of 50-guage (10-mils) and shall have two layers applied.

PART 4 TESTING AND INSPECTION

A. The CONTRACTOR'S CORROSION ENGINEER shall submit his proposed test procedures to the ENGINEER at least five (5) days in advance of the time that the cathodic protection system testing is scheduled. The ENGINEER or the OWNER'S representative shall witness all testing at their discretion. All test data shall be submitted to the ENGINEER within seven (7) days of the completion of the testing. All testing shall be conducted under the supervision of a qualified CORROSION ENGINEER who is retained by the CONTRACTOR. All deficiencies found to be due to faulty materials or workmanship shall be repaired or replaced by the CONTRACTOR and at his/her expense.

4.02 TEST LEADS

A. It is the CONTRACTOR's responsibility to test all test leads.

B. TEST METHOD. All completed wire connection welds shall be tested by striking the weld with a 2-lb hammer while pulling firmly on the wire. Welds failing this test shall be re-welded and re-tested. Wire welds shall be spot tested by the ENGINEER. After backfilling the pipe, all test lead pairs shall be tested using a standard ohmmeter.

C. ACCEPTANCE. The resistance between each pair of test leads shall not exceed 150% of the total wire resistance as determined from published wire data.

4.03 ANODE INSTALLATIONS

A. The CONTRACTOR shall ensure that the anode pre-packed backfill or sack is not damaged and that the anode lead wire is properly attached. The CONTRACTOR'S CORROSION ENGINEER shall inspect each anode bag and anode lead wire for integrity before the anode is installed in the anode hole. Additionally, the CORROSION ENGINEER shall verify anode hole depths. The ENGINEER or the OWNER'S Representative shall inspect and test the anode installations at their discrepancy.

B. TEST METHOD. A visual inspection of anode lead wires, anode pre-packed backfill, and anode hole depths (using tape measure). Obtain open-circuit anode potentials using a high impedance volt meter and copper/copper sulfate reference electrode.

C. ACCEPTANCE. All anode leads are properly attached (with no splices), anode hole depths verified, and open-circuit anode potentials are in compliance with this specification. Damaged test leads and damaged pre-packed anode backfill bags shall be rejected and removed from the project site.

4.04 TEST LEAD TRENCHING

A. The ENGINEER, at his or her discretion, shall inspect wire trenches and backfill material and methods.

B. TEST METHOD. The depth, trench bottom, padding, and backfill material shall be visually inspected prior to backfilling.

C. ACCEPTANCE. Conformance with specifications.

4.05 PIPELINE CONTINUITY THROUGH IN-LINE APPURTENANCES AND PIPE JOINTS

A. The CONTRACTOR'S CORROSION ENGINEER shall measure the linear resistance of sections of pipe in which in-line valves, non-welded pipe joints, or other flanged mechanical joints have been installed. All testing shall be done by the CORROSION ENGINEER in the presence of the ENGINEER.

B. TEST METHOD. Resistance shall be measured by the linear resistance method. A direct current shall be impressed from one end of the test section to the other (test station to test station). A voltage drop is measured for several different current levels. The measured resistance (R) is calculated using the equation R=dV/I, where dV is

the voltage drop between the test span and I is the corresponding current. The resistance shall be measured for at least three (3) different current levels.

C. ACCEPTANCE. Acceptance is a comparison between the measured resistance (from the field test data) and the theoretical resistance. The theoretical resistance must consider the pipe (length and wall thickness) and the resistance of the bond wires. The measured resistance shall not exceed the theoretical resistance by more than 130% to determine electrical continuity. The CONTRACTOR'S CORROSION ENGINEER shall submit, within seven (7) days of the completion of the testing, and in a report format, to the ENGINEER, all calculations of the theoretical resistance and measured pipe resistance for each section tested.

4.06 CATHODIC PROTECTION PERFORMANCE

A. The cathodic protection system shall be activated and tested by the CONTRACTOR'S CORROSION ENGINEER in the presence of the ENGINEER.

B. TEST METHOD. The installed cathodic protection system testing shall include: native (static) pipe-to-soil potentials, open-circuit anode potentials, activated pipe-to-soil potentials, test lead to test lead resistance measurements, and anode current output measurements.

C. ACCEPTANCE. Shall be based on achieving the –850 mV polarized potential criterion as outlined in NACE SP0169. All data shall be submitted, in a typed 8-1/2 X 11 inch report to the ENGINEER for acceptance before the project is considered complete.

4.07 FLANGE ISOLATION KITS

A. Responsibility: Insulating flanges shall be inspected and tested by the CONTRACTOR'S CORROSION ENGINEER and in the presence of the ENGINEER, prior to backfilling.

B. Test Method: The assembled flange shall be tested using a Gas Electronics Model 601 Insulation Checker specifically design for testing insulating flanges. The testing shall be done by a qualified CORROSION ENGINEER accepted by the ENGINEER. NACE SP0286 may also be used to determine the effectiveness and acceptance of the flange isolation kit.

C. Acceptance: The installation of the insulating flange kit shall be considered complete when the testing device indicates no shorts or partial shorts are present. The CONTRACTOR shall provide assistance in finding any and all shorts or shorted bolts. All disassembly and reassembly necessary for acceptance shall be done at the CONTRACTOR'S expense.

4.08 ELECTRICAL ISOLATION TESTING BETWEEN PIPE AND STEEL REINFORCEMENT

A. Conduct visual and electrical testing before and after concrete placement to demonstrate that all buried steel pipe is not in contact with steel reinforcement in concrete structures and pipe encasements, including all embedded rebar tie wires, snap ties, she-bolts, tie rods, taper ties, and dowels. Perform this testing no more than 1 day before each concrete placement and no more than 1 day after each concrete placement. Correct all direct contacts detected between sections of pipe to be buried and concrete reinforcing components by trimming or repositioning the reinforcement components. If pipe to reinforcement contacts are detected after concrete is in place, remove the concrete as necessary to eliminate all points of contact. This testing shall be performed by the Contractor's Corrosion Engineer and witnessed by the Engineer. A failure for a new pipeline to pass this electrical isolation test may require concrete and reinforcing steel to be demolished at no cost to the City until the new pipeline passes this test.

B. Perform all electrical resistance measurements for this test using a 97-Hertz square wave null balancing ohmmeter such as the Model 400 Nilsson Soil Resistance Meter and the four-wire resistance technique. A standard handheld digital multi-test meter's ohmmeter circuit (e.g. Fluke 87) is not suitable for properly making these resistance measurements. Perform this test by connecting the meter's P1 and C1 terminals to the pipe, using two wires, and then connecting the meter's P2 and C2 terminals to the rebar, using two additional wires. Use vise grips or temporary exothermic welds to make the wire connections to the pipe and rebar.

C. Rebar Ground Cable Connections at Pipe Encasements and Vault Penetrations: Select two exposed pieces of rebar separated by at least 2 feet that are wire tied to a minimum of 6 other pieces of rebar for the electrical ground reference test points. Using temporary connections such as vice grips or other compression clamps measure the electrical resistance between the two different pieces of rebar to ensure that the rebar test points are electrically continuous with the bulk of the rebar in the concrete structure. If either piece of rebar is not securely wire tied to all the other rebar in the encasement or vault, then the electrical resistance measurement will yield erroneous or misleading data. A maximum resistance of 0.10 Ohm between the two rebar test points is required before continuing the electrical isolation test. Connect two un-spliced lengths of minimum size #2 AWG bare copper stranded grounding cable to the rebar. Make the ground cable connections to the two different pieces of rebar. Each ground cable connection to the rebar shall be made with a separate exothermic weld or a separate mechanical ground clamp. Direct Resistance Isolation Test: Testing shall first be performed using the Direct Resistance Test. Move one pair of the resistance test leads to the pipe and measure the pipe to rebar resistance. If the resistance is 10 Ohms or more, the pipe is sufficiently electrically isolated from the rebar. If the test reading is less than 10 Ohms, proceed with the Steel Polarization Isolation Test.

D. Steel Polarization Isolation Test:

1. Step 1: Measure the baseline CP potentials of the buried pipeline and the rebar using a stationary location for a copper sulfate reference electrode.

Place the reference electrode in the soil at an offset distance from the pipeline equal to approximately the length or width (whichever is greater) of the concrete structure under construction. If the difference between the readings is 500 millivolts or more, that indicates sufficient electrical isolation. This test must be done with all nearby sources of cathodic protection turned off or disconnected, and with all welding equipment turned off. If the difference is less than 500 millivolts, record the baseline CP Potentials and proceed to the next step.

2. Step 2: Set up a temporary DC power source such as an automotive battery, a rheostat, a calibrated shunt, and two minimum #6 AWG test cables. Set up the DC power source with the positive cable connected to the rebar and the negative cable connected to the pipe. Initially adjust the rheostat for the largest resistance/smallest current and measure the current flow. Adjust the electrical power to a minimum current of 1 DC Amp, maximum of 10 DC Amps. Allow the DC current to flow for a minimum of 5 minutes then shut off the test current.

3. Step 3: Re-measure CP Potentials of the pipe and rebar using the same reference electrode in the same location with the test current off. These are called polarized CP potentials.

4. Step 4: Compare the polarized CP Potentials with the previously measured baseline CP Potentials. If the pipe is electrically isolated from the rebar, the test current will polarize the buried pipeline's steel cathodically (i.e. a more negative CP Potential) and shift the rebar anodically (i.e. a more positive CP Potential). If the difference between the polarized potentials of the pipeline and rebar is less than 300 millivolts there are one or more metallic contacts between the buried pipeline and the rebar.

E. If a Contractor wishes to use an alternate test procedure, prepare a written test procedure specifying the methods and equipment that will be used. Submit it to the Engineer for approval a minimum of 30 days before the first concrete placement. In no case shall an electrical resistance measurement made with a volt-ohm multi-meter be accepted as an accurate isolation test procedure. In the event of a question regarding the electrical isolation of the pipeline, the Engineer shall make the final determination.

F. Electrical isolation tests shall be conducted for each pipeline encasement, each pipe to vault penetration, and any other reinforced concrete and pipeline structure one day before placing concrete, and the day after the concrete is placed. The Engineer will witness the electrical isolation test conducted before the concrete is placed.

G. After the pipeline passes the rebar isolation test, direct bury the two bare copper ground cables connected to the rebar to a flush-to-grade concrete ground box near the pipe-vault penetration. Provide a cover for the test box marked "GROUND". Provide a minimum of two (2) feet of extra ground cable inside the rebar ground test box. If the rebar test wires are no long enough to reach the permanent test box,

splice additional wire to them using two brass split bolts for each splice. No coating is required for the connections.

4.09 COMPLIANCE WITH SPECIFICATIONS.

A. Deficiencies or omissions in materials or workmanship found by these tests shall be rectified at the CONTRACTOR'S expense. Deficiencies shall include but are not limited to: broken leads, improper or unclean trenches, lack of 18-inch or slack wire in test boxes; improperly mounted test boxes; improper anode installations (including soaking), and other deficiencies associated with the workmanship, installation, and non-functioning equipment.

4.10 PAYMENT

A. Payment for all cathodic protection work shown on the drawings and specified herein shall be included in the lump sum bid item in the bid proposal form and shall include all incidental related work, such as but not limited to, coordination with City's corrosion control specialist, demolition, trenching, backfill, compaction, surface restoration, traffic control, special inspections and testing necessary to make a complete and a functional system.

END OF SECTION

SECTION 13520
COMPUTER SYSTEM SOFTWARE

PART 1 - GENERAL

1.1 SCOPE.

This section covers computer system software to be furnished and installed by System Supplier.

A. System Supplier shall furnish standard, field proven, fully debugged and supported software packages for this application with a minimum of additions or changes. Customized or specially written software shall be furnished only if required to meet all functional requirements specified herein.

B. Software is described in functional categories. System Supplier shall furnish a complete software package including the functional requirements specified, along with any additional software required for proper and efficient operation of the system.

C. No attempt has been made to list all software or all characteristics of software required by System Supplier to meet the functional requirements specified, nor to determine the location of the software modules within the system.

D. The computer control software shall meet the design conditions and performance.

1.2. CONTROL SYSTEM.

A. The Instrumentation and Control System section shall apply to all software furnished under this section. Additional software requirements are indicated in the Software Control Block Description section.

1.3. GENERAL.

A. Software packages shall control computer system level activities as well as higher level process control activities, allowing the process to be monitored and controlled through an interactive operator interface.

B. Interface. Users shall be able to interface to all process control activities through fully interactive software modules initiated and operated using easily recognized icons or custom symbols or driven by full-screen and pull-down menus. Selection of icons or menus shall be through pointing devices and shall not normally require the use of an alphanumeric keyboard. Systems that require the use of typed commands to move from module to module or from display to display are not acceptable.

C. Execution. Throughout the execution of all software modules, the operator shall be presented with all command or operation choices available at that point in the program to make the choices self-explanatory and unambiguous. Question-and-answer or fill-in-the-blank requests are acceptable only where file names, tag names, or other unique text or numerical information is required.

D. Configuration. All programs shall be self-configuring to obtain the size and configuration of the system from parameters contained in the various files created

during system generation. No parameters related to the hardware configuration shall be hard coded into any of the software.

E. Version. All programs shall be the latest version commercially available at the time the system is delivered to the City. Superseded versions, revisions, or releases are not be acceptable.

F. Drawings. Supplementing this section, the drawings indicate locations and arrangement of computer enclosures and provide one-line and block diagrams regarding the connection and interaction with other equipment.

1-3. SUBMITTALS.

A. In addition to the requirements of Section 16900 Controls and Instrumentation, a complete description of the software packages and modules shall be submitted to verify compliance with this section.

1-4. DELIVERY AND SHIPPING.

A. Delivery and shipping shall be as in the Instrumentation and Control System section.

PART 2 - PRODUCTS

2-1. OPERATING SYSTEM SOFTWARE.

A. Operating system software shall be MS Windows 7 Professional and shall include a complete and unmodified operating system that provides system level functions.

2-2. PROCESS CONTROL SYSTEM APPLICATION SOFTWARE.

A. Process control software shall enable the operator to monitor and control field devices connected to PLCs, RTUs, or other input/output hardware. The process control system application software shall meet the following minimum requirements and shall exceed these requirements where necessary to comply with the functional requirements of the project.

B. A license shall be issued for each machine loaded with process control software.

C. Approved Software. The process control system application software shall be Unity Pro XL PLC, no substitutions. City approval is required and City reserves the right to make changes without incurring additional cost prior to purchase. Contractor is responsible for programming and configuring the PLC. Provide a licensed copy of PLC programming software.

D. Password Protection. Operator access within the control system software shall be controllable through a password-based security scheme. Operators shall be assigned their own user account and password. Three levels of security protection shall be provided. Each system display, database block, control action, and software module shall be assigned its own security levels and shall be inaccessible to users without proper security clearance. After initial creation, passwords shall be field alterable, but only by the assigned user or a system administrator.

E. System Response. All responses to the operator shall be clear, unambiguous, and complete. Every operator menu, target selection, or request shall generate a response providing the range of choices for the next step in the process, or indicating

that the request or chosen operation has been completed, is being processed, or cannot be performed. Every operator menu or target pick shall generate a graphic or text message response, even if it is a negative one.

F. Interactive Software Commands. The software's interactive command structures, user interface, menu organization, and procedures shall be consistent and predictable for all software modules throughout the system. Similar operations shall be performed in a similar manner, so that an operator will not need to learn different techniques for initiating the same operation in different software modules.

G. Operator Commands. The software shall accept each operator command or selection, decode it, and check its validity and correctness in the sequence of data and operations previously presented. Invalid or incorrect commands or menu selections shall not be processed; instead, a message shall be generated which explains why the command or menu selection is invalid. When a command or selection is canceled prior to being fully processed, the software shall clear all pending sequences and shall not initiate any system control commands.

H. Database. The software shall include a comprehensive interactive database system for creating, sorting, editing, and monitoring all process inputs and outputs and internally used variables and control blocks. The system shall request, receive, process, and store all real-time data according to the information contained in the database. Database points shall be enabled or disabled individually at any time by an operator working at the proper security level. All internal database point information shall be accessible to other external database software applications through SQL commands.

I. Interactive Database Editor. An interactive database editor software module shall be provided for creation, inspection, and modification of database entries. Modification, addition, or deletion of database information shall not require direct changes to the program source code. Changes made in the database contents or formatting shall automatically update all locations at which the information is stored or used.

J. Custom Algorithms. The software shall enable the users to create their own custom algorithms or command sequences through accessing database points, internal pseudo-point variables, math and logic comparisons, and standard system functions. Each algorithm and command sequence shall run independently and shall be configurable to be executed on demand, based upon an event or condition, on a timed-interval, or at a set time of day.

K. Programming Language. A programming-type language or environment shall be considered acceptable if it is integrated into the base control system software product; if any compilers, linkers, and other necessary software modules are either included with the base software or supplied and configured by System Supplier; if technical support is provided directly by the control software vendor; and if all control system database points for local system and variables are accessible to the programmer.

L. Alarm Processing. Alarm processing software shall be provided to recognize and report alarms to the operator in an organized, unambiguous, clear, and convenient manner. Alarms shall be classified into at least five priority levels and at least two independent classes. System events shall be considered alarms classified by their own specific priority or class.

M. Alarms. Alarm processing software shall generate alarms for at least the following conditions.

1. Discrete input or output change of state if defined as an alarm in the database.
2. Analog value exceeding the alarm limits defined in the database.
3. Analog rate of change exceeding the limits defined in the database.
4. Failure of any process input/output hardware, communications link, or other major hardware component.

N. Acknowledgment. Alarms shall be generated as they occur and shall not be cleared until they have been acknowledged and conditions have returned to normal.

O. Alarm Summary Display. An alarm summary display shall be provided which lists at least 100 of the most recent alarms in all classes, with the most recent alarm listed first. Alarms shall appear flashing or in a unique color until they are acknowledged by the operator. Alarms of different priorities shall be easily distinguished on all alarm displays through the use of unique colors or similar methods.

P. Each operator workstation in the system shall be configured to display only certain alarms, alarm classes, and alarm priorities based on the preferences of City and Engineer.

Q. Alarm Logging. Alarm logs shall constitute a soft-copy record saved in the historical database of all alarms, events, and significant operator actions. Alarm displays and alarm log entries shall include the date and time that the alarm was detected, the tag name and description of the alarmed point, and an entry describing the nature of the alarm. Alarms shall be logged saved in the historical database as they occur on existing system as directed by City.

R. Responses to Alarms. An audible alarm shall sound at the operator's console at each occurrence of a new alarm event. The audible alarm shall be silenced when it is acknowledged by the operator.

S. The audible alarm shall use an external sound system, such as a sound card and external speakers.

T. Alarm Enabling. Alarms originating from database entries such as discrete change of state or analog limit violations shall be enabled or disabled on a point-by-point basis.

U. Alarm Notification Software. An external alarm notification software package shall be provided to generate alarms for a paging system. Two licensed copies of the software shall be provided. Work station requirements is in process to be determined by City.

V. Operator Interface. System software shall be suitable for creation and modification of alphanumeric and graphic displays and linking of dynamic fields to database variables.

W. System Storage. The system shall be capable of storing and utilizing 100 full-screen user displays and pop-up windows, each containing any number of the following components.

1. Static and dynamic alphanumeric information.

2. Static and dynamic or object-based graphics.
3. Dynamic bar graph displays.
4. Dynamic analog real-time and historical trends displays.
5. Static and dynamic bitmap (Windows .BMP compatible) graphics.

X. Component and Configuration Information. The software shall enable the user to reuse components and configuration information from any screen or pop-up window with or without modification. All configuration information shall be displayed in any of 256 colors, flashing or non-flashing. Dynamic fields shall change color or from flashing to non-flashing and back in response to a change in value, state, or alarm condition of the linked variable. Dynamic objects linked to process inputs and outputs shall be capable of displaying at least three equipment states, such as on/off/alarm for pumps, or open/close/intermediate for valves.

Y. Communications. System software shall support communications among computers and PLCs as indicated on the drawings and as specified herein. System Supplier shall be responsible for any device driver development required to support the communications indicated. See the Multiple Address Radio Equipment section for communications requirements.

Z. Data Retrieval and Transmission. The software shall retrieve and send data from and to all remote field devices indicated on the drawings. The software shall perform all required error checking to ensure the validity of all data transactions and proper completion of the scan sequence. All communication system malfunctions, including "no response", shall be reported to the system as alarms. Re-transmission shall be utilized to correct or overcome communication errors.

AA. Communications Driver. The software shall be supplied with communications drivers capable of communicating with any existing remote field devices indicated on the drawings as well as all software input/output drivers required to communicate with all field devices and system hardware that are furnished as part of the control system.

BB. Historical Data Storage. The software shall include modules for historical data gathering, data reduction, and reporting. Real-time analog signal values shall be collected and stored in the historical database based on a user defined time interval of 1 second to 1 day, or on a change of state deadband configured for each database point. Alarms and events shall be collected and stored in the historical database as they occur. The historian shall support the following features.

1. The historical database shall be a real-time relational database. The database shall be an extension of Microsoft SQL Server. The historical database shall acquire point information from the graphical user database for the local system.
2. Access to data shall be by any SQL or ODBC compliant software package, such as Crystal Reports, Microsoft Excel, or Microsoft Access.
3. Database shall allow the use of a separate I/O server for data from the programmable logic controller system.

CC. Data Reduction Capabilities. Data reduction capabilities shall be provided to average and reduce data to hourly records, and the hourly records to daily records. Entries for all hourly and daily averaged records shall include sample, average,

minimum and maximum values as defined by City. Both hourly and daily averages for each day shall be stored in the historical database.

DD. Retrieval Software. Data retrieval software shall be provided to allow access to historical data files for the following uses:

1. Tools shall be provided for remote trending and display of the data on all user workstations. Trend displays shall allow up to eight tags to be graphed in the window. Graphs shall allow stacking or separate display of each tag. Displays shall allow save functions for retrieval from the computer hard drive. Trends shall display real-time data, or display data from the history files. The trend display shall show the timeframe of stored data.
2. Import/export of data from/to ASCII files.
3. Inclusion in user-generated reports.
4. Tools for Microsoft Excel display of data shall be included. Tools shall allow the retrieval and display of real-time data, or historical data.

2.3 SOFTWARE DOCUMENTATION.

A. System Supplier shall relinquish all documentation supplied with the software furnished, such as user manuals, programmer guides, reference cards or keyboard templates, and related materials. In addition, System Supplier shall generate and submit to City and Engineer written documentation of any configuration work, modifications of the system, or setup of software done before or after installation of equipment on the site. Documentation shall be electronic with one hard copy. This includes any and all information on the development of any "wizards" or "scripts" created for the use in this project.

2.4 PLC SOFTWARE.

A. The requirements for PLC software are specified in the Programmable Logic Controller.

2.5 EXTENDED SUPPORT OR WARRANTY.

A. The process control system software shall include the extended or comprehensive support service of the manufacturer. The service shall include all software updates and phone and personal support when needed. The service shall be for a period of one year after final acceptance and shall cover all software packages supplied under this contract.

PART 3 - EXECUTION

3.1 INSTALLATION REQUIREMENTS.

A. The System Supplier shall install the process control software on the control system hardware specified in another section.

B. Configuration. Contractor is responsible for adapting and converting the current PLC program (provided by City) to the Unity Pro XL software. System Supplier shall install and properly configure any supplemental programs, modules, and software packages necessary to meet the functional requirements of the project as described in the Instrumentation and Control System and Software Control Block Description sections.

C. Quantity. The System Supplier shall install one full development software package(s), on the operator workstation if required and as directed by C.

D. Software. City shall provide a laptop with current version of Windows 7 to the contractor. The contractor shall install a licensed copy of Unity Pro XL and return to City after project completion.

END OF SECTION

SECTION 13562
IN-LINE FLOW MEASURING SYSTEMS

PART 1 -- GENERAL

1.1 WORK OF THIS SECTION

A. The Contractor shall provide in-line liquid flow measuring systems, complete and operable, in accordance with the Contract Documents.

1.2 RELATED SECTIONS

A. The Work of the following Sections applies to the Work of this Section. Other Sections, not referenced below, shall also apply to the extent required for proper performance of this Work.

1. Section 16700 Supervisory Control Data Acquisition (SCADA)
2. Section 16900 Controls and Instrumentation

1.3 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

A. Except as otherwise indicated, the current editions of the following apply to the Work of this Section:

1.	ANSI/NCSL-2540-1	Calibration Laboratory and Measuring and Test Equipment General Requirements
2.	ANSI B16.5	Pipe Fittings and Flanged Fittings, NPS 1/2 through NPS 24
3.	ANSI/AWWA C207	Steel Pipe Flanges for Waterworks
4.	ASTM B61	Specification for Steam or Valve Bronze Castings

1.4 CONTRACTOR SUBMITTALS

A. Shop drawings shall conform with the requirements of
1. Section 01300 - Submittals,
2. Section16700 Supervisory Control Data Acquisition (SCADA),
3. Section 16900 Control and Instrumentation,
4. Section 15000 General Piping Requirements and Appurtenances.

PART 2 -- PRODUCTS

2.1 MAGNETIC FLOW MEASURING SYSTEMS

A. Magnetic flow measuring systems shall be of the low frequency electromagnetic induction type and produce a DC pulsed signal directly proportional to and linear with the liquid flow rate. Complete zero stability shall be an inherent characteristic of the flowmeter system. Each magnetic flow metering system shall include a metering tube, signal cable, transmitter, and flowmeter grounding rings.

1. The metering tube shall have the following attributes:

   a. Constructed of Type 304 stainless steel with flanged connections.

   b. Liner in conformance with the manufacturer's recommendation for the intended service.

   c. Electrodes constructed of materials which are in conformance with the manufacturer's recommendation for the intended service.

   d. Meter housing rated for NEMA 6 submergence conditions.

   e. Meter coating consisting of epoxy paint finish.

   f. Two grounding rings that conform with the manufacturer's bore and material recommendation for the intended service. Grounding rings shall be designed to protect and shield from abrasion the liner edge interface at the meter end.

2. The microprocessor-based signal converter/transmitter shall have the following attributes:

   a. Use DC pulse technique to drive flux-producing coils.

   b. Convert DC pulse signal from the tube to a standardized 4-20 mA signal into a minimum of 700 ohms.

   c. A 6 digit LCD display for flow rate, percent of span, and totalizer.

   d. An operator interface consisting of keypads which respond to English text entry.

   e. Integral zero return to provide a consistent zero output signal in response to an external dry contact closure.

   f. Integral low flow cutoff and zero return.

   g. Automatic range change.

   h. Capable of measuring flow in both directions.

i. Programmable parameters including meter size, full scale Q, magnetic field frequency, primary constant, time constant.

j. Data retention for a minimum of 5 years without auxiliary power (main or battery).

k. Self diagnostics and automatic data checking.

l. Protected terminals and fuses in a separate compartment which isolates field connection from electronics.

m. Use "Smart" technology which employs a hand-held configuration terminal and outputs a digital flow signal superimposed on 4-20 mA signal and complies to HART protocol.

n. Produce a scaleable frequency output, 0 to 100 Hz, transistor switch closure up to 5.75 W externally powered, 5 to 24 VDC.

o. Tolerate ambient temperature operating limits of -20 to +140 degrees F.

p. Meter should have a local readout register with totalizer display.

q. AMI and Serial interface ready

B. Calibration: Each magnetic flowmeter system shall be hydraulically calibrated at a facility which is traceable to the National Institute of Standards and Technologies. The calibrations procedure shall conform to the requirements of ANSI/NCSL-2540-1. A real-time computer generated printout of the actual calibration data indicating apparent and actual flows at 20, 40, 60, 80 and 100% of the calibrated range shall be submitted to the Resident Engineer at least 30 days before shipment of the meters to the project site.

C. Performance: The flow metering system shall conform to the following requirements:

1. Time constant = 0.5 to 1000 seconds; galvanic or optic isolation.

2. Accuracy: 0.5% of flow rate from 1 ft/sec to 33 ft/sec.

3. Repeatability: 0.25% full scale.

4. Power consumption: 30 watts or less.

5. Power Requirements: 120 VAC, 10%.

D. The following magnetic flow measuring systems shall be provided:

Tag No. FT	Size 24"	Range 0-35,000 gpm	Liner Material (A)	Electrode Material (A)	NEMA Rating Body/Transmitter NEMA 6

(A) NOTE: Liner/Electrode Material to be provided per manufacturer recommendations

E. Manufacturer:

1. ABB FLOW MASTER (No Substitutions)

PART 3 – EXECUTION

3.1 GENERAL

A. In-line flow measuring systems shall be executed according to following:
   1. Section 16700 – Supervisory Control Data Acquisition (SCADA),
   2. Section 16900 – Controls and Instrumentation,
   3. Section 15000 – General Piping Requirements and Appurtenances.

B. Contractor shall provide training for operating and maintaining flow meter.

END OF SECTION

SECTION 13563
PRESSURE AND LEVEL INSTRUMENTS

PART 1 GENERAL

1.1. SCOPE

A. The Pressure and Level Instruments section covers the furnishing of pressure and level instruments and accessories required for the Instrumentation and Control System as indicated on the drawings.

B. Equipment and services provided under this section shall be subject to Section 16900 Controls and Instrumentation. Supplementing Section 16900 Controls and Instrumentation, instrument data, special requirements, and options are indicated on the drawings or the Instrument Device Schedule.

C. When multiple instruments of a particular type are specified, and each requires different features, the required features are described on the drawings or the Instrument Device Schedule.

1.2. DESIGN CRITERIA.

A. Each device shall be a pre-assembled, packaged unit. Upon delivery to the work site, each device or system shall be ready for installation with only minor piping and electrical connections required by Contractor.

B. Primary elements shall derive any required power from the transmitter, unless otherwise indicated.

C. The instruments shall be installed to measure, monitor, or display the specified process at the ranges and service conditions indicated on the drawings or as indicated in the Instrument Device Schedule. The instruments shall be installed at the locations indicated on the drawings or in the Instrument Device Schedule.

D. Where possible, each instrument shall be factory calibrated to the calibration ranges indicated in the drawings or in the Instrument Device Schedule. Transmitters or similar measurement instruments shall be calibrated using National Institute of Standards and Technology (NIST) approved bench calibration procedures, when such procedures exist for the instrument type. Calibration data shall be stored digitally in each device, including the instrument tag designation indicated on the drawings and/or Instrument Device Schedule.

1.3. SUBMITTALS.

A. Submittals shall be made as specified in Section 16900 Controls and Instrumentation.

1.4. SHIPMENT, PROTECTION, AND STORAGE.

A. Equipment provided under this section shall be shipped, protected, and stored in accordance with the requirements of the Instrumentation and Control System section. Identification of packaging shall be as described in the Instrumentation and Control System section.

PART 2 PRODUCTS

2.1. GENERAL.

A. The following paragraphs provide minimum device stipulations. The drawings or Instrument Device Schedule shall be used to determine any additional instrument options, requirements, or service conditions.

2.2. INTERCONNECTING CABLE

A. For systems where the primary element and transmitter are physically separated, interconnecting cable from the element to the transmitter shall be provided. The cable shall be the type approved by the instrument manufacturer for the intended purpose of interfacing the element to the transmitter. Length of cable shall be a minimum of three meters or as indicated in the drawings or Instrument Device Schedule.

2.3. PROGRAMMING DEVICE

A. For systems that require a dedicated programming device for calibration, maintenance, or troubleshooting, one such programming device shall be provided for each City facility (quantity required shall be as indicated in the Instrumentation and Control System section.) The programming device shall include appropriate operation manuals and shall be included in the training requirements. For systems that allow the programming device functions to be implemented in software, running on a laptop computer, the software shall be provided instead of the programming device.

2.4. CONFIGURATION SOFTWARE/SERIAL INTERFACE

A. Devices indicated as requiring a serial interface shall be provided with all accessories required to properly communicate over the serial link. An appropriate cable shall be provided to allow the transmitter serial interface to be connected to a personal computer. One licensed copy of the diagnostic/interface software shall be provided for each City facility (quantity required shall be as indicated in the Instrumentation and Control System section). Software shall be capable of running under Microsoft's Windows XP operating system. If the software furnished performs the same functions as the programming device, specified elsewhere, then the programming device shall not be furnished.

2.5. PRESSURE AND LEVEL INSTRUMENTATION

A. Premium Accuracy Pressure and Pressure Sensing Level Transmitters

1. Transmitters shall be an all solid state electronic two-wire device that does not require a direct power connection to the transmitter. Process fluid shall be isolated from the sensing elements by AISI Type 316 stainless steel, Hastelloy-C, ceramic, or cobalt-chromium-nickel alloy diaphragms, and the transducer may use a silicone oil fluid fill. Transmitters shall have self-diagnostics and electronically adjustable span, zero, and damping. Transmitters shall be enclosed in a NEMA Type 4X housing and shall be suitable for operation at temperatures from 0° to 180°F, and relative humidity of 5 to 100 percent. All parts shall be cadmium-plated carbon steel, stainless steel, or other corrosion-resistant materials. Transmitters shall have over-range protection to maximum line pressure. Accuracy of the transmitter shall be 0.05 percent of span, and

transmitter output shall be 4-20 mA dc without the need for external load adjustment, or shall have a Foundation fieldbus output signal where so indicated on the instrument device schedules. Transmitters shall not be damaged by reverse polarity. Transmitters shall have an elevated or suppressed zero . For calibrated spans of less than 8 psig a differential pressure type transmitter with side vents shall be utilized. Transmitters shall be provided with brackets for wall and pipe-stand mounting.

2. Transmitters shall be factory calibrated to the required range and provided with the manufacturer's standard hand-held communications/calibration device. One device shall be furnished for all transmitters provided by a single manufacturer.
3. Transmitters tagged on the drawings or specified to be indicating type shall be furnished with LCD type digital indicators.
4. Transmitters will have a turndown ratio of 80:1.
5. Transmitters shall be SMAR LD series transmitters. No Substitutions.

B. Pressure Switches

1. Pressure switches shall be diaphragm actuated type switches. Switches shall be field adjustable type, with trip point repeatability better than 1 percent of actual pressure. Switches shall have over-range protection to maximum process line pressure. Switches mounted inside panels shall have NEMA Type1 housings. All other switches shall have weatherproof housings. Switches shall be differential type where indicated in the Instrument Device Schedule. Switch wetted parts shall be compatible with the process fluid. Where the process is not defined, all wetted parts shall be Teflon-coated or viton and the connection port shall be stainless steel.
2. Panel-mounted and surface-mounted switches shall be provided with 1/4 inch NPT connections. All stem-mounted switches shall be provided with 1/2 inch NPT connections.
3. All pressure switches shall be ranged in psi and all vacuum switches in inches of water. Unless otherwise indicated, switches shall have a fixed deadband and shall be auto-reset type. As a minimum, switches shall be SPDT, rated 5A amp at 120 V ac.
4. Each switch shall be provided with a threaded end, ball-type shutoff valve. Shutoff valve materials shall be compatible with the process fluid. Where the process is not specified, valves shall have AISI Type 316 stainless steel wetted parts and Teflon seals. Multi-port valves shall have all unused ports plugged. Shutoff valve construction shall be as detailed in Section 15091
5. The switches shall be provided with a pressure snubber. Each snubber shall be of a size and pressure range compatible with the switch served. Snubbers shall be Ashcroft "Pulsation Dampers", or approved equal.
6. Switches shall be installed at the locations indicated on the drawings, with installation conforming to the installation details. All switches, snubbers, and diaphragm seals shall be installed in the vertical, upright position. Thread sealer, suitable for use with the associated process, shall be used in the assembly of threaded connections. All connections shall be free from leaks. Lines shall be

purged of trapped air at switch locations prior to installation of the switch or diaphragm seal.

7. Switches shall be manufactured by Ashcroft, Barksdale, NeoDyn, Mercoid Controls, or S.O.R.

C. Flood Level Switches

1. The flood detecting level switches shall be float actuated and shall be suitable for wall bracket or sump mounting, as indicated on the drawings or in the Instrument Device Schedule. The switch float mechanism shall actuate when the water level rises to 1 inch above the bottom of the housing. The switch contacts shall be hermetically sealed, rated for 0.1 amp at 120 V ac, and shall be field changeable from normally open to normally closed. Flood switches shall be Switches shall be GEM Model LS-270 series or equal ".

D. Field-Mount Pressure Gauges

1. Pressure gauges shall be of the indicating dial type, with C-type phosphor bronze Bourdon tube; stainless steel rotary geared movement; phenolic or polypropylene open front turret case; adjustable pointer; stainless steel, phenolic, or polypropylene ring; and acrylic plastic or shatterproof glass window.

2. Gauge dial shall be 4-1/2 inch size, with white background and black markings. The units of measurement shall be indicated on the dial face. Subdivisions of the scale shall conform to the requirements of the governing standard. Pointer travel shall be not less than 200 degrees or more than 270 degrees of arc.

3. Surface-mounted gauges shall be provided with 1/4 inch NPT connections. All stem-mounted gauges shall be provided with 1/2 inch NPT connections. Where indicated in the drawings or on the Instrument Device Schedule, stem mounted gauges shall have an adjustable viewing angle to allow the gauge to be positioned for optimum viewing.

4. All pressure gauges shall measure in psi and all vacuum gauges in inches water. All gauges shall have a suitable range to give mid-scale readings under normal conditions. Gauge accuracy shall be 0.5 percent of scale range.

5. Each gauge shall be provided with a threaded end, ball-type gauge valve. Gauge valve materials shall be compatible with the measured process. Where the process is not defined, gauge valves shall have AISI Type 316 stainless steel wetted parts and Teflon seals. Multi-port gauge valves shall have all unused ports plugged. Gauge valve construction shall be as detailed in Section 15091.

6. Where indicated on the drawings or the Instrument Device Schedule, the pressure gauge shall be provided with a pressure snubber. Each snubber shall be of a size and pressure range compatible with the gauge served. Snubbers shall be Ashcroft "Pulsation Dampers", or approved equal.

7. Gauges shall be installed at the locations indicated on the drawings, with installation conforming to the installation details. All gauges, snubbers, and diaphragm seals shall be installed in the vertical, upright position. Thread sealer, suitable for use with the associated process, shall be used in the assembly of threaded connections. All connections shall be free from leaks. Lines shall be

purged of trapped air at gauge locations prior to installation of the gauge or diaphragm seal.

8. Each gauge shall be provided with all required mounting hardware to securely mount the unit according to the mounting requirements indicated in the drawings or the Instrument Device Schedule.
9. Unless otherwise indicated, mounting at the location indicated on the drawings and installation hardware shall be Type 316L stainless steel.
10. Pressure gauges shall be Ashcroft "1279 Duragauge", or equal.

2.6. TEMPERATURE INSTRUMENTATION

A. Resistance Temperature Detectors

1. Each temperature detector shall be a nominal 100 ohm, three or four wire, hermetically sealed, platinum resistance element. The sensing element shall be enclosed in an AISI Type 316 stainless steel outer sheath. Accuracy shall be ± 1°F [±0.6°C] over the specified operating range.
2. Each temperature detector shall be provided with a thermowell. Unless otherwise indicated in the drawings or Instrument Device Schedule, thermowells shall be weld mount style. Thermowell materials shall be compatible with the process fluid. Where the process fluid is not defined, thermowells shall be AISI Type 316 stainless steel. The approximate process insertion length of the thermowell shall be as indicated on the drawings or in the Instrument Device Schedule. The temperature element shall be spring-loaded in the thermowell. Appropriate temperature head hardware shall be provided with the assembly.

B. Temperature Switches

1. Temperature switches shall be ambient compensated, filled type, with integral sensor and thermowell. Switches shall be field adjustable type, with trip point repeatability better than 1 percent of actual temperature. Switches shall be housed in EEMAC Type 4 enclosures. Switch wetted parts shall be compatible with the process fluid. Where the process fluid is not defined, the switch shall be provided with an AISI Type 316 stainless steel sensing element and an AISI Type 316 stainless steel thermowell.
2. All temperature switches shall be ranged in degrees Fahrenheit. Unless otherwise indicated, switches shall have a fixed deadband and shall be auto-reset type. As a minimum, switches shall be SPDT, rated 10 amp at 120 V ac.
3. Each switch shall be provided with a thermowell. Unless otherwise indicated in the drawings or Instrument Device Schedule, thermowells shall be weld mount style. Thermowell materials shall be compatible with the process fluid. Where the process fluid is not defined, thermowells shall be AISI Type 316 stainless steel. The approximate process insertion length of the thermowell shall be as indicated on the drawings or in the Instrument Device Schedule.
4. Switches shall be installed at the locations indicated on the drawings, with installation conforming to the installation standards. All switches shall be installed in the vertical, upright position. Thread sealer, suitable for use with the associated process, shall be used in the assembly of threaded connections. All

connections shall be free from leaks. Lines shall be purged of trapped air at switch locations prior to installation.

5. Each switch shall be provided with all required mounting hardware to securely mount the unit according to the mounting requirements indicated in the Drawings or Instrument Device Schedule.
6. Unless otherwise indicated, mounting and installation hardware shall be AISI Type 316L stainless steel.
7. Temperature switches shall be Ashcroft, or equal.

C. Temperature Gauges.

1. Temperature gauges shall be of the indicating dial type, with a stainless steel bimetal thermometer and a stainless steel thermowell; stainless steel rotary geared movement; phenolic or polypropylene open front turret case; adjustable pointer; stainless steel, phenolic, or polypropylene ring; and acrylic plastic or shatterproof glass window.
2. Gauge dial shall be 4-1/2 inch [114mm] size, with white background and black markings. The units of measurement shall be indicated on the dial face. Subdivisions of the scale shall conform to the requirements of the governing standard. Pointer travel shall be not less than 200 degrees or more than 270 degrees of arc.
3. Panel-mounted and surface-mounted gauges shall be provided with 1/4 inch [6 mm] NPT connections. All stem-mounted gauges shall be provided with 1/2 inch [12 mm] NPT connections. Where indicated on the drawings or the Instrument Device Schedule, stem mounted gauges shall have an adjustable viewing angle to allow the gauge to be positioned for optimum viewing.
4. All temperature gauges shall display temperature in degrees Fahrenheit. All gauges shall have a suitable range to give mid-scale readings under normal conditions. Gauge accuracy shall be 1 percent of scale range.
5. Each gauge shall be provided with a thermowell. Unless otherwise indicated in the drawings or Instrument Device Schedule, thermowells shall be weld mount style. Thermowell materials shall be compatible with the process fluid. Where the process fluid is not defined, thermowells shall be AISI Type 316 stainless steel.
6. Gauges shall be installed at the locations indicated on the drawings, with installation conforming to the installation standards. All gauges shall be installed in the vertical, upright position. Thread sealer, suitable for use with the associated process, shall be used in the assembly of threaded connections. All connections shall be free from leaks. Lines shall be purged of trapped air at gauge locations prior to installation.
7. Each gauge shall be provided with all required mounting hardware to securely mount the unit according to the mounting requirements indicated on the drawings or the Instrument Device Schedule.
8. Unless otherwise indicated, mounting and installation hardware shall be AISI Type 316L stainless steel.
9. Temperature gauges shall be Ashcroft "50 Series", or equal.

PART 3 EXECUTION

3.1. FIELD SERVICES.

A. Manufacturer's field services shall be provided for installation, field calibration, startup, and training as specified in the Instrumentation and Control System section.

B. Instruments shall not be shipped to the Work Site until two weeks prior to the scheduled installation. System Supplier shall be responsible for coordinating the installation schedule with the Installation Contractor. Each shipment shall contain a listing of protective measures required to maintain sensor operation, including a listing of any common construction or cleaning chemicals that may affect instrument operation.

END OF SECTION

SECTION 13590
NETWORK SYSTEMS

PART 1 GENERAL

1.1 SCOPE

A. The Networks Systems section covers the furnishing of all hardware and software for network systems for the Computer Control System. Principal components of the network systems shall be as indicated on the block diagram drawings and as described below.

System Supplier shall furnish all necessary equipment, interconnecting cables, accessories, and appurtenances for proper network operation and to meet the functional requirements indicated on the drawings and specified herein. Configuration of all hardware shall be provided by the System Supplier.

Supplementing this section, network data, special requirements, and options may be indicated on the drawings.

B. Control System

1. The Instrumentation and Control System section shall apply to all systems described in this section. All applicable requirements specified in the Instrumentation and Control System section shall apply to equipment and services provided under this section.

C. Network Functional Description

1. The network system shall provide communications between the operator workstations, servers, PLCs, and MAS and Spread Spectrum radios.

1.2 GENERAL

A. System Supplier shall select the equipment furnished under this section for its superior quality and the intended performance. The System Supplier shall install all equipment in accordance with the manufacturer's instructions. Equipment and materials used shall be subject to review and shall comply with the following requirements.

B. General Equipment Stipulations

1. The General Equipment Stipulations shall apply to all equipment and materials provided under this section. If requirements in this specification differ from those in the General Equipment Stipulations, the requirements specified herein shall take precedence.

C. Drawings

1. Supplementing this section, the drawings indicate locations and arrangement of hardware and enclosures, provide mounting details, and may show other information regarding the connection and interaction with other equipment.

D. Governing Standards

1. Governing Standards for network systems shall be as specified in the Instrumentation and Control System Section.

E. Power and Instrument Signals

1. Unless otherwise specified, electric power supply to the network equipment will be unregulated 24 volts dc or 120 volts ac.

F. Appurtenances

1. Special power supplies, special cable, special grounding, and isolation devices shall be furnished for proper performance of the equipment.

G. Interchangeability and Appearance

1. To the extent possible, components used for similar types of functions and services shall be the same brand and model line. Similar components of different network hardware shall be the products of the same manufacturer to facilitate maintenance and stocking of repair parts. Whenever possible, identical units shall be furnished.

H. Programming Devices

1. A programming or system-configuring device, or software required for programming, shall be provided for systems that contain any equipment that requires such a device or software for routine maintenance and troubleshooting. The programming device shall be complete, newly purchased for this project, and shall be in like-new condition when turned over to City at completion of startup. Programming software shall be licensed to the City.

1.3 SUBMITTALS

A. Submittals shall be made in accordance with the requirements of Section 16900 Controls and Instrumentation and as listed below.

B. The submittals shall include the following items for the Ethernet Network Design submittal (to be provided with the First Stage Submittals):

1. A complete network topology diagram, detailing all hardware, cabling and the interconnections between all connected equipment. Interconnections to existing installed equipment shall be included in the diagram.

2. A complete listing of IP addresses to be assigned to all equipment furnished under this contract shall be provided. The assignment of IP addresses shall be coordinated with the City.

C. All above documentation shall also be provided in the O&M manuals.

1.4 DELIVERY, SHIPMENT, PROTECTION, AND STORAGE

A. Equipment provided under this section shall be shipped, protected, and stored as specified in the Instrumentation and Control System Section. Identification of packaging shall be as described in the Instrumentation and Control System Section.

1.5 CONNECTION TO CITY NETWORKS

A. Network hardware and software provided shall be compatible with the City 's existing network systems wherever a system interconnection is provided. System Supplier shall verify existing systems to ensure compatibility.

B. All connections to the City 's existing network shall be fully coordinated between the City and the System Supplier. Prior to connecting to the existing network, the System Supplier shall provide a written request to the City for a City representative to be available when existing systems are disconnected and at the time of any new connections.

1.6 COORDINATION WITH CITY

A. The System Supplier shall coordinate all demolitions, installations and rework on the existing networks with the City and the Resident Engineer. No work shall be performed without the written consent of the City. The System Supplier shall submit a written request to perform work on the existing network, including date, time, scope of work, length of time, and any City s support that may be required.

PART 2 PRODUCTS

2.1 GENERAL

A. The following paragraphs provide minimum Ethernet network device stipulations

2.2 NETWORK CABLING SPECIFICATIONS

A. CAT-6 cable shall be used for Ethernet connectivity.

B. A complete fiber optic cable distribution system shall be provided as a part of the System. The Contractor shall provide a fiber optic cable that meets the minimum bandwidth requirements for FDDI, ATM, and Frame Relay services. This fiber optic cable shall be a 62.5/125 micron multi-mode, containing a minimum of 18 strands of fiber, unless otherwise specified, and shall not exceed a distance of 2,000 Meters (M), or 6,560 feet (ft.) in a single run. Loose tube cable, which separates the individual fibers from the environment, shall be installed for all outdoor runs or for any area which includes an outdoor run. Tight buffered fiber cable shall be used for indoor runs. The multimode fibers shall be terminated and secured at both ends in "ST" type female stainless steel connectors installed in an appropriate patch or breakout panel with a cable management system. A 610 mm (2 ft.) cable loop (minimum) shall be provided at each end to allow for future movement.

2.3 ETHERNET NETWORK HARDWARE

A. Ethernet network hardware shall be provided as specified and/or as shown on the drawings. All specified functionality of provided Ethernet network equipment shall adhere to the IEEE 802 standards. Ethernet Hubs will not be accepted for network systems.

1. Manufacturer: Schneider Electric TCSESM163F23F0

B. Network Routers

1. Routers shall be provided to allow connection of a Wide Area Network (WAN) to the Local Area Network (LAN). These routers shall provide the flexibility to adapt to changing requirements, features and performance to support new WAN services, and integration of multiple network functions to simplify deployment and management operations.

    a. LAN Connection: 10/100 Base-T Ethernet Port

    b. WAN Connection: At least 2 CSU slots. Provide CSU for a T1E1 interface to enable direct connection to the phone company network

    c. Management: Browser based, and SNMP v2 or v3.

    d. IEEE 802.1p QoS Support.

    e. Router Redundancy Functionality (HSRP, VRRP, etc) where required to meet the specified functionality.

    f. VLAN Support

    g. Rack mounting, where required for proper installation.

2. Router manufacturer: Cisco, or equal.

C. Network Firewall

1. Network firewall hardware shall be a dedicated hardware device and provide security and isolation between networks. Firewalls shall have the following functionality:

    a. Stateful Packet Inspection and Filtering

    b. DHCP and Network Address Translation Services

    c. Virtual private networking (VPN) support

    d. A minimum of three dedicated or configurable DMZ port.

    e. A minimum of five integrated 10/100Base-T ports

    f. Management: Browser based, and SNMP v2 or v3.

    g. Logging of all access through the firewall.

    h. Rack mounting, where required for proper installation.

2. Firewall shall be Cisco, or equal.

D. Ethernet Connectors

1. Ethernet wiring connectors shall be RJ-45 male modular plug connectors.
2. Standard RJ45 Connectors

    a. Standard connectors shall be polycarbonate, clear connectors. Connectors shall conform to RJ-45 and ISO 8877 standards. Contacts shall be gold plated with a 0.5A current rating and a -25° to 60° C temperature rating. Connectors shall accept unshielded Cat-5e or Cat-6, AWG 24, solid conductor cable.

2.4 ETHERNET NETWORK SOFTWARE

A. All Routers shall be managed from a graphical user interface on a Microsoft Windows operating system computer. Network management software and all network equipment provided by the System Supplier shall be compatible with each other, allowing management of each device from the provided software. Network management software shall be the latest version of Cisco netmanager IP Infrastructure, or equal.

2.5 SPARE PARTS

A. Spare parts shall be provided as specified below.

Spare parts	Quantity
Switches	0 of each type
Routers	1 of each type
Firewalls	1 of each type
Converters	0 of each type

PART 3 EXECUTION

3.1 NETWORK INSTALLATION REQUIREMENTS

A. Additional network installation requirements are specified in the Instrumentation and Control System section. Networks shall be installed and tested in accordance with the following requirements.

3.2 NETWORK CONFIGURATION

A. The System Supplier shall fully configure all network devices. All device selections shall be fully coordinated with the City to ensure compatibility with existing systems and standards.

B. Routers

1. The System Supplier shall fully configure all network routers. The routers shall be configured for all network and telephone interfaces.

C. Firewalls

1. The System Supplier shall fully configure all network firewalls. The firewall shall be configured for all network connections provided under this contract, and shall be configured to exclude devices not part of the control system network unless otherwise specified. The firewall shall be configured to deny all traffic, except for traffic specifically allowed in the ruleset.

D. Network Configuration Report

1. The System Supplier shall provide a configuration report to the City detailing all connections, addresses, and port assignments

E. Management Software

1. Management software shall be fully configured for all network devices provided.

3.3 NETWORK TESTING

A. After each network has been installed, a technical representative of System Supplier shall test the network and shall provide a written report for each test.

B. Field Testing

1. After each network has been installed, a technical representative of System Supplier shall test the network and shall provide a written report for each test. Specific testing requirements are described in the individual network specification sections.

C. Systems Check

1. A technical representative of System Supplier shall participate in the checkout of network systems. Systems check requirements shall be as specified in the Instrumentation and Control System section.

D. Test Equipment

1. Unless specified otherwise, all test equipment for the calibration and checking of system components shall be provided by System Supplier for the duration of the testing work and this test equipment will remain the property of System Supplier.

E. Ethernet Network Minimum Test Requirements

1. The following minimum tests are to be performed by the System Supplier:
    a. Verify Link Integrity Status LED is lit on both sides of each link
    b. Verify proper operation and failover of each redundant component and redundant link.
    c. Verify alarming of each link failure.
    d. Verify bandwidth Usage
2. Ethernet Network Test Reports
    a. Upon completion and testing of the installed Ethernet network, the System Supplier shall submit test reports to the Engineer in printed form. Test reports are to show all test results performed by the System Supplier for each port and piece of equipment. Date of calibration of the test equipment is also to be provided.

3.4 NETWORK TROUBLESHOOTING

A. It is the System Supplier's responsibility to provide trouble-free and reliable networks. The System Supplier shall employ any means necessary to ensure operational networks. The System Supplier shall obtain any needed test equipment, including but not limited to time-domain reflectometers, protocol analyzers and network sniffers, to troubleshoot any problems. The System Supplier shall utilize the services of a trained and certified Network Engineer that

is regularly involved in troubleshooting network problems, in the event that operational or reliability problems exist. Acceptable certifications include Cisco CCNP, Cisco CCIE, or Network Professional Association Certified Network Professional (CNP).

END OF SECTION

SECTION 13851
ADDRESSABLE FIRE ALARM SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Design, furnish, install, test, certify, and place into service a complete addressable fire alarm system. The system shall be complete with all hardware and software specifically tailored for this installation.

B. Provide a fire alarm system consisting of, but not limited to the following components:

1. Fire alarm control panel (FCP)

2. Conduit and wiring necessary to connect the FCP to alarm initiating devices, notification appliances and auxiliary equipment

3. Addressable manual fire alarm stations

4. Addressable analog area smoke detectors

5. Addressable analog heat detectors

6. Audible and visual combination notification appliances

7. Battery standby

8. Conduit and cable to building's main telecommunications room

C. Provide a fire alarm system that conforms to the requirements of the latest editions of (1) NFPA 72 National Fire Alarm and Signaling Code, (2) NFPA 70 National Electrical Code, (3) ASME A17.1 Safety Code for Elevators and Escalators, and (4) NFPA 90A Standard for the Installation of Air-Conditioning and Ventilating Systems.

1.2 SYSTEM FUNCTIONAL DESCRIPTION

A. The system shall identify any off normal condition and log each condition into the system database as an event.

1. The system shall automatically display on the control panel the first event of the highest priority by type. The priorities and types shall include alarm, supervisory, and trouble.

2. The system shall have a queue operation, and shall not require event acknowledgment by the system operator. The system shall have a labeled color-coded indicator for each type of event.

3. The user shall be able to review each event by selecting scrolling keys.

4. New alarm, supervisory, or trouble events shall sound a silence-able audible signal at the control panel.

B. Operation of any alarm-initiating device shall automatically:

1. Update the control/display as described above.

2. Audibly and visibly annunciate the alarm condition at the FCP.

3. Activate all NAC appliances in accordance with the respective evacuation plan and matching functional matrix. The fire alarm evacuation tone shall be the three-pulse temporal pattern.

4. Operate the alarm relay and initiate the transmission of an alarm signal to the Central Station over a digital alarm communicator system.

C. Activation of a supervisory initiating device shall:

1. Update the control/display as described above.

2. Audibly and visibly annunciate the supervisory condition at the FCP.

3. Operate the respective relay if applicable and initiate the transmission of a supervisory signal to the Central Station over a digital alarm communicator system.

D. The entire fire alarm system wiring shall be electrically supervised to automatically detect and report trouble conditions to the FCP. Any opens, grounds, or disarrangement of system wiring and shorts across alarm horn/strobe wiring shall automatically:

1. Update the control/display as described above.

2. Operate the trouble relay contacts to initiate the transmission of a trouble signal to the City of San Diego central station over a digital alarm communicator system.

3. Visually and audibly annunciate a general trouble condition, on the FCP. The visual indication shall remain on until the trouble condition is repaired.

E. The FCP shall have an optional LED Annunciator/Switch Card component installed and programmed for pre-defined disable groups particular to this installation. Disable groups shall consist of the following to facilitate routine inspection, testing, and maintenance (ITM):

1. All control relays that initiate/control closure of the specified combination fire/smoke dampers listed in Sections 1.2.C.3.

2. All notification appliances.

1.3 SYSTEM DESIGN

A. System Design: Provide the services of a qualified factory trained fire alarm designer for the FCP to be installed on this project. The designer shall assure the completeness and correctness of the fire alarm system design by performing the following:

1. Prepare drawings of FCP indicating location of components, interconnection of components and connections to alarm initiating, indicating, and auxiliary circuits.

2. Prepare a system input/output matrix to verify that the proper sequences occur for each initiating point or zone.

3. Prepare drawings of fire alarm layout, conduit and wiring plans. Show location of all fire alarm appliances, conduit layout, quantity, and type of wires in each conduit, and interface with other systems for functions such as central station signaling, fan shutdown, damper operation, and elevator recall.

4. Prepare terminal-to-terminal field wiring diagrams for alarm initiating, indicating and auxiliary circuits; detail the interfaces with other systems; indicate labeling of each fire alarm system conductor.

5. Calculate conductor sizes for each alarm initiating, indicating, and auxiliary circuit; limit voltage drops so that they do not exceed the FCP manufacturer's limitations, for the most remote device on each circuit.

6. Prepare battery load calculations for the FCP and any remote power supply panels and select proper battery size. Battery shall be sized to include an additional 50% safety margin above calculated system demand.

7. Calculate alarm signal in all spaces to comply with ADAAG requirements: minimum 15 dBA above ambient at all locations, but not over 120 dBA at any location.

8. Select alarm initiating, alarm indicating, and auxiliary devices compatible with FCP.

1.4 ACTION SUBMITTALS

A. Provide the following per project submittal procedures.

1. Certifications

a. Within 30 days after Notice to Proceed, certifications of the qualifications of the fire alarm installing firm as described in the quality assurance paragraph of this Section.

b. Within 30 days after Notice to Proceed, certifications of the qualifications of the fire alarm system technician as described in the quality assurance paragraph of this Section.

c. Certification (upon request) from the fire alarm control manufacturer that proposed alarm-initiating devices, alarm appliances, and auxiliary devices are compatible with the FCP and other auxiliary equipment.

1.5 QUALITY ASSURANCE

A. Qualifications of the installing firm:

1. Be licensed by any state in the United States to engage in the design, fabrication, and installation of fire alarm systems.

2. Have satisfactorily installed at least twenty fire alarm systems of equivalent nature and scope to the system described in this Section.

3. Provide the services of a qualified fire alarm system technician to design the fire alarm system and to test the completed system.

4. Be a factory-certified representative of the manufacturer of the FCP that will be used on this project.

B. Qualifications of the fire alarm system technician:

1. Be factory trained in the theory, operation, installation, and troubleshooting of the FCP that will be used for this project.

2. Have satisfactorily designed at least twenty fire alarm systems of equivalent nature and scope to the system described in this Section.

3. Have satisfactorily field-tested at least twenty fire alarm systems of equivalent nature and scope to the system described in this Section.

4. Be NICET (National Institute for Certification in Engineering Technologies) Fire Alarm Certified, or certified by an equivalent organization acceptable to the Fire Authority Having Jurisdiction.

1.6 PRODUCT HANDLING

A. Materials and Equipment: Protect from damage during shipping, storage, and installation.

PART 2 PRODUCTS

2.1 GENERAL

A. Provide materials and equipment that are new and unused, free of defects, specifically designed for the use intended, conform to the requirements of the NEC and NFPA 72, and are NRTL listed for the intended use.

B. Provide products suitable for operation at an elevation of 470 ft.

2.2 FIRE ALARM CONTROL PANEL

A. The FCP shall incorporate all control electronics, relays, and necessary modules and components in a flush or semi-flush mounted cabinet (dependent on FCP mounting location). The operating controls and zone/supervisory indicators shall be located behind locked door with viewing window. All control modules shall be labeled, and all zone locations shall be identified. The assembly shall contain a base panel, system power supply and battery charger with additional modules to meet the requirements of these specifications.

B. System circuits shall be configured as follows: Addressable analog loops Class B; Initiating Device Circuits (if used) Class B; Notification Appliance Circuits Class B.

C. The system shall store all basic system functionality and job specific data in non-volatile memory. The system shall survive a complete power failure intact.

D. The system shall allow down loading of a job specific custom program created by system application software. It shall support programming of any input point to any output point.

E. The system shall support distributed processor intelligent detectors with the following features: integral multiple differential sensors, environmental compensation, pre-alarm, dirty detector identification, automatic day/night sensitivity adjustment, dual normal/alarm LEDs, relay bases, and isolator bases.

F. The system shall use full digital communications to supervise all addressable loop devices for placement, correct location, and operation. It shall allow

swapping of "same type" devices without the need of addressing and impose the "location" parameters on replacement device. It shall initiate and maintain a trouble if a device is added to a loop and clear the trouble when the new device is defined in the system.

G. The system shall have a nationally recognized testing laboratory (NRTL) listed detector sensitivity test feature, which will be a function of the smoke detectors and performed automatically.

H. All panel modules shall be supervised for placement and initiate a trouble signal if damaged or removed.

I. The system shall have a CPU monitoring circuit to initiate a trouble signal should the CPU fail.

J. The system evacuation signal rate shall be suitable to support audio-visual combination-type electronic three pulse temporal pattern sounder and strobe combination units.

K. The system program shall meet the requirements of this project, current codes and standards, and satisfy the City of San Diego Fire Department

L. Passwords shall protect any changes to system operations.

M. The power supply shall be a high efficiency switch mode type with line monitoring to automatically switch to batteries for power failure or brown out conditions. The automatic battery charger shall have low battery discharge protection. The power supply shall provide internal power and 24 Vdc for notification appliance circuits. All outputs shall be power limited. The battery shall be sized to support the system for 24 hours of supervisory and trouble signal current plus general alarm for 10 minutes.

N. The FCP shall have a high-contrast, alphanumeric display to show system status, alarm information, and supervisory information. The FCP shall have LED indicators for the following common control functions: AC power, alarm, supervisory, monitor, trouble, disable, ground fault, CPU fail, and test. There shall be control keys and visual indicators for; reset, alarm silence, trouble silence, and drill.

O. Battery boxes, if required, shall be UL Listed for the purpose.

P. The FCP shall have a digital alarm communicator transmitter (DACT) module to transmit detailed alarm, supervisory and trouble signals to a digital alarm communicator receiver (DACR) at a Central Monitoring Station.

1. The DACT shall support dual telephone lines, "contact ID" communications format, and configured for dual-tone, multi-frequency (DTMF).

2. The DACT shall be listed for "Central Station Fire Service" and for "Proprietary Station Fire Service" and shall be of the same manufacturer as the control panel.

3. The DACT shall transmit the following information to the City of San Diego Central Station:

   - Fire alarm per point addressable device (e.g., detector or water flow activation, manual pull stations, etc.)
   - Supervisory signal per addressable device (e.g., valve tamper)
   - General System Trouble (alarm panel trouble)
     - — Loss of AC Power
     - — Communication Line Failure (Primary and Backup)
     - — Trouble per zone or point addressable device
     - — Battery Failure

4. Restoration of each signal condition identified above shall be transmitted to the Central Station.

5. The secondary telephone line shall only be utilized for signal transmission in the event that attempts to communicate utilizing the primary line are unsuccessful.

6. The secondary telephone line shall have the same account code and communication format as the primary line.

7. Loss of AC power shall be transmitted 3 hours after the detected failure.

8. A test signal shall be sent once every 24 hours.

9. For consistency, telephone wire color configuration shall be as follows:

1 - Four-pair wire (preferred method)

To DACT				To Premise Telephone			
Pair 1		Pair 2		Pair 1		Pair 2	
Tip 1	Ring 1	Tip 2	Ring 2	Tip House 1	Ring House 1	Tip House 2	Ring House 2
White/ Blue	Blue/ White	White/ Orange	Orange/ White	White/ Green	Green/ White	White/ Brown	Brown/ White

Q. Manufacturers: EDWARDS EST3X or NOTIFIER NFS 2-640, no substitutions

2.3 LED ANNUNCIATOR/SWITCH CARD

A. Provide compatible components programmed per the pre-defined disable groups in Paragraph 1.2.E particular to this installation.

B. Manufacturers: EDWARDS EST 4X-12SR or NOTIFIER Annunciator Control Module ACM-24AT. no substitutions.

2.4 ADDRESSABLE THERMAL DETECTORS

A. Provide addressable, intelligent, fixed temperature or rate-of-rise thermal detectors that are compatible with and acceptable to the FCP manufacturer. The heat detection design documentation shall state the required performance objective of the system. The designer responsible for the strategy of the structure as a whole shall establish the "type" selection criteria.

1. The detector shall be rated at 135°F and shall be spaced according to the detector manufacturer's spacing guidance and the structure's attributes. For applications requiring other than 135 °F, consult the Authority Having Jurisdiction. If no guidance from manufacturer is available follow NFPA 72 requirements.

B. Manufacturers: EDWARDS EST SIGA2-HFS or SIGA2-HRS, or NOTIFIER FST-851 or FST-851R, no substitutions.

2.5 ADDRESSABLE PHOTOELECTRIC DETECTORS

A. Provide addressable, analog, intelligent, photoelectric type smoke detectors that are compatible with and acceptable to the FCP manufacturer.

1. The photoelectric detector shall be rated for ceiling installation at a minimum of 30 ft (9.1m) centers and be suitable for wall mount applications.

B. Manufacturers: EDWARDS EST SIGA2-PS or NOTIFIER FSP-851. no substitutions.

2.6 DETECTOR MOUNTING BASES

A. Provide standard bases suitable for mounting on 3-1/2" or 4" octagon box and 4" square box. The base shall contain no electronics and support all detector types. Removal of the detector shall not affect communications with other detectors.

B. Manufacturers: EDWARDS EST SIGA-SB or NOTIFIER B210LP Low profile base. no substitutions.

2.7 ADDRESSABLE MANUAL PULL STATIONS

A. Provide addressable double-action, non-coded manual pull stations that are acceptable to the FCP manufacturer and are compatible with the FCP.

B. The fire alarm station shall be of Lexan or metal construction with an internal toggle switch. Provide a key locked test feature. Finish the station in red with

white "PULL IN CASE OF FIRE" lettering. The manual station shall be suitable for mounting on 2-1/2" deep 1-gang boxes and 1-1/2" deep 4" square boxes with 1-gang covers.

C. Provide the appropriate back boxes and mounting plates for flush-mounting or surface mounting (depending on the building construction).

D. Manufacturers: EDWARDS EST SIGA 278 or NOTIFIER NBG-12LX. no substitutions.

2.8 ADDRESSABLE CONTROL RELAY MODULES

A. Provide modules acceptable to the FCP manufacturer and compatible with the FCP.

B. The control relay module shall provide one "Form C" dry relay contact rated at 2 amps at 24 Vdc to control external appliances or equipment shutdown. The control relay shall be rated for pilot duty and releasing systems. The position of the relay contact shall be confirmed by the system firmware.

C. Manufacturers: EDWARDS EST SIGA-CR or NOTIFIER FRM-1, no substitutions.

D. Provide additional relays with voltage and current ratings as required to perform functions such as air handling system shutdown and elevator recall.

E. Control relays should be installed in a "readily accessible location and height".

2.9 AUDIBLE AND VISUAL COMBINATION NAC DEVICES

A. Provide NRTL-listed 24 VDC audio-visual combination-type electronic three-pulse temporal pattern sounder and strobe combination units that are acceptable to the FCP manufacturer and are compatible with the FCP.

B. Sounder shall include three-pulse temporal pattern generating electronics, audio transducer, and screw terminals housed in a red housing. Acoustical output shall meet requirements of UL 464. The audible signal shall be the "American National Standard Audible Emergency Evacuation Signal" (three-pulse temporal pattern) in accordance with ANSI S3.41, *Audible Emergency Evacuation Signal.*

C. Strobe signal output and flash rate shall meet UL 1971 and ADAAG requirements. Unit shall have a xenon flash tube enclosed in a clear Lexan lens with "FIRE" in white lettering, and shall produce a synchronized strobe flash. Provide strobes with flash output levels as required to meet NFPA 72 visual signal requirements for each space.

D. Horn/strobe shall mount to a 4" x 2-1/8" deep electrical box with single device cover. Provide weatherproof wall boxes for outdoor mounting.

E. Manufacturers: EST "GENISIS" series, Wheelock "Exceder" series, or System Sensor "P" Series. no substitutions.

2.10 NOTIFICATION BOOSTER POWER SUPPLIES

A. Provide notification circuit booster power supplies (as needed) that are acceptable to the FCP manufacturer and are compatible with the FCP.

B. Manufacturers: EDWARDS EST "BPS-10A" or NOTIFIER "ACPS-610." no substitutions.

2.11 CONDUIT

A. Install fire alarm wiring in conduit. Minimum conduit size 3/4 inch. One-half (1/2)-inch flex conduit is allowed in between addressable monitor modules and sprinkler-related devices (not to exceed 6 feet in length).

B. Refer to Section 16050, *Basic Electrical Materials and Methods,* for conduit systems.

2.12 JUNCTION BOXES

A. Refer to Section 16050, *Basic Electrical Materials and Methods,* for junction boxes.

2.13 WIRING

A. Color Code: Use the following color code for the fire alarm system wiring:

1. Black - 120-Volt AC phase wire.
2. White - 120-Volt AC neutral wire.
3. Green - System ground wire.
4. Brown - Negative connection for strobe device. (If wired separately from horns.)
5. Orange - Positive connection for strobe device. (If wired separately from horns.)
6. Blue - Negative connection for horn circuit or horn/strobe combination circuit.
7. Yellow - Positive connection for horn circuit or horn/strobe combination circuit.

8. Gray - Negative conventional alarm initiating device connection.

9. Violet - Positive conventional alarm initiating device connection.

10. Black - Negative circuit connection for duct smoke detector reset, HVAC interlock, and other auxiliary connections.

11. Red - Positive circuit connection for duct smoke detector reset, HVAC interlock, and other auxiliary connections.

12. Black/Red Twisted Pair - Addressable device data loop, evacuation speaker circuit.

B. Conductors: Provide alarm and supervisory signaling system conductors that meet the requirements of Article 760 in the NEC and are NRTL-listed for the type of service to which they will be subjected. Minimum conductor requirements:

1. Interior/Dry Locations: Red-jacketed NEC type FPL cable with No. 16 AWG (minimum) twisted-pair conductors for addressable devices (shielded if required by the FCP manufacturer), and listed per UL1424.

    a. Low voltage binary signal conductors shall be type THHN, or THWN thermoplastic insulation, No. 16 AWG minimum, and solid copper conductor.

    b. Other low voltage conductors shall be type TFN, No. 16 AWG (minimum), thermoplastic insulation, and single solid copper conductor.

2. Exterior/Wet Locations: Red or Black-jacketed NEC type FPL cable with No. 16 AWG (minimum) twisted-pair conductors for addressable devices (shielded if required by the FCP manufacturer), and listed for WET locations per UL1424. Manufacturers: West Penn Catalog #AQ225 or CSC Catalog #100475.

    a. Low voltage binary signal conductors shall be type THWN-2, thermoplastic insulation, No. 16 AWG minimum, and solid copper conductor.

3. Power conductors shall be type THHN/THWN-2, No. 12 AWG, thermoplastic insulation, and single solid copper conductor.

4. Size conductors of the fire alarm systems as recommended by the manufacturer, based on the operating ampacity of the circuit and the permissible resistance and voltage drop characteristics that will allow proper operation of the equipment. Provide conductors selected to provide voltages

within the manufacturer specification limits for the most remote fire alarm notification appliance or field device.

5. Design each addressable analog loop so device loading will not exceed 80% of loop capacity in order to leave for space for future devices.

2.14 TEST EQUIPMENT

A. Provide any special test equipment manufactured by the fire alarm equipment manufacturer for maintenance, testing, or troubleshooting.

2.15 SURGE PROTECTION

NOTE: All surge protectors shall be installed to be readily accessible for servicing.

A. Provide a UL 1449 listed 120V surge protective device for the main FCP, each sub-FCP, and each booster power supply that has a 120V supply circuit.

1. Device shall be capable of absorbing a maximum single pulse of at least 6,500 amperes.

2. Clamping voltage shall not exceed 330 volts line-to-neutral when tested in accordance with ANSI/IEEE C62.31 category C1/B3.

3. Manufacturer: EDCO Model "FAS-120AC" or as recommended by the FCP manufacturer.

B. Provide a UL 497B listed surge protective device for each analog initiating device signaling circuit entering/leaving each building that is monitored by the FCP.

1. Device shall be capable of absorbing a peak 8x20 microsecond current of 10,000 amperes at least 10 times.

2. Clamping voltage shall not exceed 30 volts.

3. Capacitance shall not exceed 50pf.

4. Provide matching receptacle for plug-in surge protective devices.

5. Manufacturer: EDCO model "PC642C-030LC" (protects 2 pairs) and "PCB1B" socket, or as recommended by the FCP manufacturer.

C. Provide a UL 497B listed surge protective device for each 24-volt initiating device circuit or control circuit entering/leaving each building that is monitored by the FCP.

1. Device shall be capable of absorbing a peak 8x20 microsecond current of not less than 10,000 amperes at least 10 times.

2. Clamping voltage shall not exceed 30 volts.

3. Provide matching receptacle for plug-in surge protective devices.

4. Manufacturer: EDCO model "PC642C-030" (protects 2 circuits) and "PCB1B" socket, or as recommended by the FCP manufacturer.

D. Provide a UL 497B listed surge four-wire protective device for each FCP RS-232 circuit entering/leaving each building monitored by the FCP.

1. Device shall be capable of absorbing a peak 8x20 microsecond current of 10,000 amperes at least 10 times.

2. Clamping voltage shall not exceed 20 volts for RS-232 applications.

3. Provide matching receptacle for plug-in surge protective devices.

4. Manufacturer: EDCO model "PC642C-020" with "PCB1B" socket, or as recommended by the FCP manufacturer.

E. Provide a UL 497B listed surge four-wire protective device for each FCP RS-485 circuit entering/leaving each building monitored by the FCP.

1. Device shall be capable of absorbing a peak 8x20 microsecond current of 10,000 amperes at least 10 times.

2. Clamping voltage shall not exceed 8 volts for RS-485 applications.

3. Line to line and line to ground capacitance shall not exceed 50pf.

4. Provide matching receptacle for plug-in surge protective devices.

5. Manufacturer: EDCO model "PC642C-008LC" with "PCB1B" socket, or as recommended by the FCP manufacturer.

F. Provide a UL 497B listed surge protective device for each 24-volt notification appliance circuit entering/leaving each building that is monitored by the FCP.

1. Protective device shall have a series resistance not exceeding 0.2 ohms per pair and shall be capable of carrying a continuous current of 5 amperes.

2. Device shall be capable of absorbing a peak 8/20 microsecond current of 5000 amperes and a 2000-ampere occurrence at least 50 times.

3. Clamping voltage shall not exceed 43 volts.

4. Provide matching receptacle for plug-in surge protective devices.

5. Manufacturer: EDCO model "PHC-043" (protects 2 circuits) and "PCB1B" socket, or recommended by the FCP manufacturer.

G. Provide a single-point ground bus for each enclosure containing one or more surge protective devices. Manufacturer: EDCO model "TER-BUS" or as recommended by the FCP manufacturer.

PART 3 EXECUTION

3.1 FIELD CONDITIONS

A. Prior to installation carefully inspect the installed work of other trades, whether pre-existing or part of this project and verify that such work is complete to the point where the installation of the fire alarm system may properly commence.

B. Notify the Construction Manager if conditions exist, not resulting from work of this project, that prohibit the installation from conforming to applicable codes, regulations, standards, and the original, approved design.

3.2 INSTALLATION

A. General:

1. Install the fire alarm system in accordance with the NEC, NFPA 72, and this specification.

2. Follow Section 16050, *Basic Electrical Materials and Methods*, for anchorage requirements.

3. Verify dimensions in the field. Lay out work in the most direct and expeditious manner to avoid interference.

4. Coordinate fire alarm detectors and associated equipment with existing ceiling or roof materials, lighting, ductwork, conduit, piping, suspended equipment, structural and other building components.

5. Coordinate installation of fire alarm system with work of other trades. Protect fire alarm equipment with suitable coverings until completion of Project.

B. Device Mounting Heights:

1. Install manual pull stations with center 44 inches above finished floor.

2. Install combination audible/visual notification appliances with the bottom 84 inches above finished floor or 6 inches below ceiling, whichever is lower. In high bay type areas the devices may be installed at a maximum of 96 inches above the floor. Any deviations from these heights require approval from the AHJ.

C. FCP Installation

1. Install FCP following manufacturer's written instructions, NFPA 72, and the NEC.

2. Locate the FCP in the main building lobby or entry vestibule so fire department personnel entering the building can readily access it.

3. Install FCP with top of cabinet trim 66 inches above finished floor. Refer to manufacturer's recommended installation height.

4. Mount FCP plumb and rigid without distortion of the box. Mount flush cabinets uniformly flush with wall surfaces.

5. Install filler plates in unused spaces in FCP.

6. Train conductors in cabinet gutters neatly in groups; bundle and wrap with cable ties after completion of testing.

7. Tighten electrical connectors and terminals, including grounding connections, according to the manufacturer's published torque-tightening values. Where manufacturer's torque values are not indicated, use those specified in UL 486A.

D. Control relays: Install in a readily accessible location and height acceptable to the AHJ.

E. Wiring Installation:

1. Install fire alarm system wiring in conduit raceway.

2. Do not pull wire or cable until the conduit system is complete between pull points.

3. Bundle conductors in panels and boxes into groups by service and destination.

4. Run electronic cable continuous between termination points. No splicing is permitted without prior approval from the AHJ. Where splicing is approved, use terminal strips. Do not use "wire nuts."

5. Do not install AC current-carrying conductors in the same raceway with the DC or digital fire alarm detection and signaling conductors.

6. Circuit each addressable analog loop so device loading shall not exceed 80% of loop capacity in order to leave for space for future devices–the loop shall have Class B operation. Where it is necessary to interface conventional devices provide intelligent modules to supervise Class B wiring.

7. Minimize the number of T-taps in fire alarm addressable data circuits and adhere to the manufacturer requirements/limitations. Make no T-taps in notification appliance circuits. T-taps shall only be made on device terminals or on terminal strips. Do not use "wire nuts."

8. Make allowances in conductor length at panels and other enclosures to permit forming the conductors neatly within the enclosures. Where wiring troughs are not provided with the enclosures, neatly cable and adequately support the wiring.

9. Ring out and identify power and control conductors before terminal connections are made. Check polarity and phasing and make changes as required before making terminal connections.

10. Test conductors for continuity and for freedom from shorts or unintentional grounds.

F. Junction Box and Conduit Installation: Refer to Section 16050, *Basic Electrical Materials and Methods*, requirements. Provide minimum 3/4" fire alarm system conduit.

G. Install audible and visual notification appliances in the following locations to obtain an audible signal level that is at least 15 dB above ambient but does not exceed 120 dB at any location:

1. Mechanical equipment rooms

2. Electrical Rooms.

3. Pump Room.

4. Other rooms as indicated on the drawings.

H. Surge Protective Device (SPD) Installation

1. Install a 120V SPD for the main FCP, each sub-FCP, and each booster power supply.

2. Install an SPD for each initiating device circuit, notification appliance circuit, data, and signaling line circuit entering/leaving each building that is monitored by the FCP.

3. SPDs shall be installed so that they are readily accessible for servicing.

4. If permitted by the FCP manufacturer, install SPDs in the FCP cabinet.

5. If the FCP manufacturer does not allow SPDs to be installed within the FCP cabinet, install one or more metal enclosures near the protected fire alarm equipment. Provide separate enclosures for 120V and signal voltage devices, or provide one enclosure with a metal partition to separate the 120V from the signal voltage devices.

6. Install a single-point ground bar in the enclosure for the SPD. Bond the ground bar to the enclosure and to the power circuit equipment-grounding conductor. Connect each SPD to the ground bar with a separate 12 AWG solid, green-insulated ground wire. Keep ground wires as short and straight as possible.

7. Install SPDs in accordance with manufacturer's instructions, keeping leads and ground conductors as short and straight as possible.

I. Identification

1. Follow Section 16050, *Basic Electrical Materials and Methods*, for all system components.

2. Label each conductor at each terminal and junction point. Use wire markers specified in Section 16050, *Basic Electrical Materials and Methods.* On wire markers indicate the type of fire alarm circuit (e.g. Pull Stations, Fan Shutdown, Alarm Strobes, etc.).

3. Label fire alarm junction boxes with 2-1/4" x 1/2" (minimum size) pressure sensitive vinyl markers having "FIRE ALARM" in red letters on a white background.

4. Label all devices with address/zone information. Use self-adhesive vinyl labels with 3/4 inch (minimum) lettering easily visible without a ladder.

5. Where a circuit breaker is the disconnecting means for FCP normal AC power, provide a breaker locking device per NFPA 72 Section 10.6.5.4. Use the appropriate type of lock for the breaker.

3.3 PAINTING

A. Exposed Surfaces: Paint exposed fire alarm conduit, panels, cabinets, pullboxes, supports, and other electrical equipment as follows:

1. Galvanized Surfaces: Paint for repairing galvanized materials shall be zinc-rich type.

2. Refinishing: Thoroughly clean and touch up shop-primed or finish-painted surfaces damaged in handling or installation with paint supplied with the equipment or an approved matching paint.

3. Interior Conduit: Paint new exposed interior conduit in rooms finished and/or occupied to match the existing background paint color. Paint conduit to be painted with one coat of primer. Paint conduit to match the existing background colors with two coats of paint to provide a minimum thickness of 6 mils.

3.4 EQUIPMENT INSTALLATION

A. Install devices or equipment not specifically covered by these specifications in accordance with manufacturer's instructions.

3.5 CLEANING

A. Blow out junction boxes and fire alarm equipment not hermetically sealed with clear, dry, oil-free (15 psig maximum) air to remove dust and dirt prior to energizing.

3.6 FIELD QUALITY CONTROL

A. Provide the services of a qualified factory trained and certified technician for the FCP installed on this project. The factory technician shall assure the completeness and correctness of the installation by performing the following:

1. Prepare as-built documentation of FCP indicating location of components, interconnection of components, and connections to alarm initiating, indicating and auxiliary circuits.

2. Field-verify and mark as-built drawings of fire alarm layout, conduit and wiring plans, and point-to-point field-wiring diagrams.

3. Verify correct labeling of fire alarm system conductors.

4. Verify that conductor sizes are adequate for each alarm initiating, indicating and auxiliary circuit.

5. Prepare as-built battery load calculations. Battery shall be sized to include the additional 50% safety margin above calculated system demand.

6. Measure and adjust audible alarm signal in all spaces to comply with ADAAG requirements: minimum 15 dBA above ambient, but not over 120 dBA at any location.

7. Test all devices for proper supervision and alarm operation.

8. Perform pre-final acceptance inspections and tests of the fire alarm system modifications.

9. Prepare final acceptance test plan when required.

B. After the pre-final test, provide a report to the Project Leader indicating the status of the fire alarm system and any corrective actions required before the acceptance tests.

C. Submit a detailed test plan for the final acceptance test.

1. Submit the test plan not less than 10 working days before the planned final acceptance date.

2. Follow test methods outlined in NFPA 72.

D. Submit FCP program at least two weeks prior to final acceptance test.

E. Submit final drawings, calculations, and manufacturer's data at least one week prior to final acceptance test.

F. Coordinate date of final acceptance test with installer. Make corrective actions before final acceptance test date.

3.7 FINAL ACCEPTANCE TEST

A. Notify City of San Diego' a minimum of 2 weeks in advance of final acceptance tests. The more advance notice will help minimize scheduling conflicts and delays. Perform final acceptance tests in the presence of authorized representatives of City of San Diego.

B. Before the final acceptance test begins, present a preliminary copy of the Record of Completion to the authorized representative of the City of San Diego Fire Department.

1. Preliminary Record of Completion shall be of the form required by NFPA 72.

2. Indicate on the preliminary Record of Completion that the pre-final inspections and tests have been performed and all corrective actions have been completed.

3. The final acceptance test shall not proceed before the Record of Completion is presented to the authorized representative of the City of San Diego Fire Department.

C. Perform final acceptance tests on the completed fire alarm system:

1. Follow the approved test plan and comply with NFPA 72 requirements.

2. Test FCP and the connected initiating, alarm, and auxiliary devices.

3. Perform 24-hour discharge test on the FCP batteries.

D. At the final acceptance test, have marked-up shop drawings and point-to-point wiring diagrams available for review and verification. Final acceptance test will not proceed without these as-built documents. If City of San Diego' verification of the as-built documents reveals errors, re-verify the complete fire alarm raceway and wiring system in the presence of a City of San Diego Fire Department representative.

E. Correct deficiencies discovered in the final acceptance test and re-test fire alarm system until satisfactory test results are obtained.

F. Upon successful completion of acceptance tests, submit final "Record of Completion" and "Inspection and Testing Form" and "recommended spare parts" list.

3.8 SYSTEM IDENTIFICATION PLACARD

A. Furnish and install a permanently mounted placard in or adjacent to the fire alarm control cabinet.

B. Provide the following information typewritten or engraved on the placard:

1. Name, address and telephone number of installing subcontractor.

2. Reference to the standards, including date of issue to which the system conforms (e.g. NFPA 72 and NFPA 70, latest edition).

3. Circuit number of power supply to FCP and location of the electrical panelboard.

4. Location of fire alarm system Operating and Maintenance Instructions if they are not stored in the FCP cabinet.

5. Location of fire alarm system as-built documents.

END OF SECTION

SECTION 14600
HOISTS AND CRANES, GENERAL

PART 1 GENERAL

1.01 WORK OF THIS SECTION

A. The Work of this Section includes providing general requirements for electric motorized hoists and motorized trolley.

B. The CONTRACTOR shall furnish install and place in satisfactory operation the hoisting equipment and appurtenances complete with all necessary safety equipment, in accordance with the Contract Documents.

C. The CONTRACTOR shall furnish and install the tracks, ancillary steel, and appurtenances necessary for all monorail hoists and bridge cranes.

D. Crane and hoists shall be coasted in accordance with Section 09900 – Painting and Coating.

E. The Work of this Section requires that one manufacturer accept responsibility for furnishing the Work as indicated but without altering or modifying the CONTRACTOR's responsibilities under the Contract Documents. The Work additionally requires that the one manufacturer who accepts the indicated responsibilities shall manufacture the major components of the equipment.

F. The Work also includes coordination of design, assembly, testing and installation.

1.02 RELATED SECTIONS

A. The Work of the following Sections applies to the Work of this Section. Other Sections, not referenced below, shall also apply to the extent required for proper performance of this Work.

Section 09900 – Painting and Coating

Section 11000 – Equipment General Provisions

Section 14605 – Electric Monorail Systems

1.03 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

A. Except as otherwise indicated, the current editions of the following apply to the Work of this Section.

1. Demolition and removal of existing site improvements and structures.

2. Removing below-grade construction.

3. Disconnecting, capping or sealing, and removing site utilities

1.	AISC	Specifications for the Design, Fabrication, and Erection of Structural Steel for Buildings
2.	AGMA	American Gear Manufacturers Association
3.	ANSI B30.11	Overhead and Gantry Cranes (Top Running Bridge, Single or Multiple Girder, Top Running Trolley Hoists)
4.	ANSI B30.16	Portal, Tower, and Pillar Cranes
5.	ANSI MH 27.1	Specifications for Underhung Crane and Monorail Systems
6.	ASTM A 36	Specification for Structural Steel
7.	CMAA	Crane Manufacturer's Association of America
8.	MMA	Monorail Manufacturers Association
9.	NEC	National Electric Code
10.	NEMA	National Electrical Manufacturers Association
11.	UBC	Uniform Building Code

1.04 CONTRACTOR SUBMITTALS

A. Shop Drawings: The CONTRACTOR shall submit complete shop drawings of all hoist and crane equipment in accordance with the requirements of the Section 01300 - Submittals and Section 11000 - Equipment General Provisions. Shop drawings shall include all electrical requirements, weights, wheel loads, dimensions, and clearances required.

B. Operation and Maintenance Information: The CONTRACTOR shall furnish operations and maintenance information in accordance with the requirements of

Section 01730 - Operations and Maintenance Information. The CONTRACTOR shall submit certification that equipment complies with the indicated requirements.

C. Tools: The CONTRACTOR shall supply one complete set of special wrenches or other special tools necessary for the assembly, adjustment, and dismantling of the equipment. All tools shall be of best quality and furnished in labeled tool boxes of suitable design.

D. Spare Parts: Each piece of equipment shall be furnished with one year's supply of lubricants, as well as spare parts as recommended by the manufacturer, such as bearings, drive belts, seals, washers, rings, and any other parts subject to wear or frequent replacement. All parts shall be properly labeled and identified with the name and number of the equipment to which they belong.

E. Certificate: The CONTRACTOR shall submit a certificate for load capacity for each crane or hoist.

1.05 QUALITY ASSURANCE

A. Inspection and Testing Requirements: After erection, the CONTRACTOR shall inspect and test all hoists and crane systems in the presence of the manufacturer's service representative, for proper operation and conformance with the Specifications.

B. Acceptance Criteria and Tolerances: The Resident Engineer reserves the right to reject any equipment not conforming with the tolerances, deflections, and lateral stiffness indicated.

1.06 MANUFACTURER'S SERVICE REPRESENTATIVE

A. The CONTRACTOR shall have the equipment manufacturer for each piece of equipment provide the services of a trained, qualified representative for at least one day after the units are put in proper working order, or as otherwise indicated, for the purpose of inspecting the installation and instructing the CITY's operating personnel. CONTRACTOR shall give the CITY written notice of the proposed instruction period at least one week prior to the commencement of the instruction period.

PART 2 PRODUCTS

2.01 GENERAL

A. The CONTRACTOR shall furnish and install all hoist and crane equipment. Equipment of similar design shall be from the same manufacturer. The CONTRACTOR shall furnish equipment of sizes and dimensions that fit the spaces available in the building

B. The capacity of each hoist and trolley shall be permanently marked in a conspicuous manner on the equipment. The wire rope reeving shall be of the two-part double, cross mounted or similar appropriate type, to provide a true, vertical lift without drift, unless otherwise indicated

C. All hooks shall be safety type with latch

D. Motors: Motors shall comply with the requirements of Section 16040 - Electric Motors and shall be of sufficient size for the rated capacity.

E. The CONTRACTOR shall verify all dimensions and clearances in the field prior to erection and shall be responsible for the proper fitting and operation of the equipment.

F. Nameplates: Nameplates shall be permanently attached to the monorail hoist and trolley hoist assemblies. Capacity shall be stated in tons or pounds. Nameplates shall be clearly legible from the floor and shall contain manufacturer's name. Warning signs shall be provided in accordance with ANSI B30.16, Chapter 16-2, affixed to the bottom lift blocks or pendant controllers.

2.02 BASIC MATERIALS

A. All materials used must be new and of the best commercial grade. Where materials are not indicated, the CONTRACTOR shall have the manufacturer use the most suitable selection for the given application and environment.

2.03 PLANT FABRICATED ITEMS

A. All fabrication, assembly, and welding shall be carried out by factory-trained specialists and certified welders.

PART 3 EXECUTION

3.01 GENERAL REQUIREMENTS

A. All hoist and crane equipment shall be installed in strict accordance with the manufacturer's printed instructions and Section 11000 - Equipment General Provisions and the CONTRACTOR shall arrange to have all installation performed under the guidance of the manufacturer's field representative. The hoist and crane equipment shall comply with the requirements of State of California, Division of Occupational Safety and Health (DOSH).

3.02 WORKMANSHIP

A. The workmanship shall be in accordance with the referenced standards and codes.

3.03 INSTALLATION

A. Care shall be taken, that the structural integrity of beams, columns, walls, floors, and roofs will be maintained at all times.

3.04 TESTING

A. After completion of the Work, the CONTRACTOR shall test all hoist and crane equipment in the presence of the manufacturer's field representative, who shall certify in writing that the equipment meets all applicable standards and specifications and verify their rated load-carrying capacity.

B. The CONTRACTOR shall have the hoist and crane equipment examined by an authorized certificating agent and obtain the necessary certificate complying with the requirements of DOSH.

END OF SECTION

SECTION 14605
ELECTRIC MONORAIL SYSTEM

PART 1 GENERAL

1.01 WORK OF THIS SECTION

A. The WORK of this Section is to provide electric monorail systems complete, in accordance with the CONSTRUCTION DOCUMENTS. Hoists shall be of the low headroom type, equipped for electric lift and travel, and they shall fit a standard I-beam.

1.02 RELATED SECTIONS

A. The Work of the following Sections applies to the Work of this Section. Other Sections, not referenced below, also apply to the extent required for proper performance of this work.

Section 11000 – Equipment General Provisions

Section 14600 – Hoists and Cranes, General

Section 16040 – Electric Motors

Section 16050 – Basic Electrical Materials and Methods

1.03 SERVICES OF MANUFACTURER

A. Services of manufacturer shall comply with Section 14600 – Hoists and Cranes, General. The authorized manufacturer's representative shall be present at the site for not less than 1 day.

1.04 CONTRACTOR SUBMITTALS

A. The CONTRACTOR shall furnish submittals in accordance with Section 01300 Submittals and Section 14600 - Hoists and Cranes, General.

PART 2 PRODUCTS

2.01 GENERAL

A. Requirement. The monorail hoist shall be controlled from a pendant pushbutton station and be furnished complete with all required safety devise and overload protection. The power supply shall be through a retractable cable reel with power cable. The rail shall be a standard I-beam with stops, securely anchored to the structure.

B. Construction: The monorail hoist shall be designed as follows:

Hoist	-	Single speed, rope-type, for parallel lug mounting from a geared trolley, with upper and lower limit switches to prevent over travel, (automatic reset type).
Gear	-	Fully enclosed, oil lubricated spur gear.
Drum	-	Steel, with machine-cut grooves and flanges, to accommodate entire cable in one layer.
Bearings	-	Anti-friction type, lifetime pre-lubricated and sealed.
Motor and Drum Shaft	-	Grease lubricated, with ball or roller bearings.
Brakes	-	Mechanical load brake and separate electric motor brake, each adjustable and capable of supporting the full load.
Power Cable	-	Of high strength plow steel, flexible, with min 5:1 safety factor, for maximum lift plus 2 wraps on drum.
Load Block	-	Heavy-duty with ball bearing sheave and forged steel swivel hook with anti-friction bearings and safety spring latch.
Motor	-	Totally-enclosed, single speed.
Trolley	-	Motor-driven, with 4 wheels, spur gear, magnetic brake, ball or roller bearings.

C. Capacity and Dimensions:

Equipment No.	-	ME-01
Capacity (tons)	-	2 Ton
Service Classification	-	Unclasified
Max Lift (feet)	-	20
Max Hook to Bottom of Monorail (feet)	-	2.5
Length of Rail (feet)	-	62
Lifting Speed (feet per minute)	-	14

Travel Speed (feet per minute)	-	60
Hoist Motor (hp)	-	2
Trolley Motor (hp)	-	1/4
Power Supply (V-phase-Hz)	-	480-3-60

D. Controls: Control equipment shall be mounted in an enclosed compartment, with NEMA rating and shall include a transformer for a 120-V control circuit. The station shall be suspended from the control compartment and shall be provided with a supporting chain or cable to locate the station 3-feet above all operating floor levels.

E. Pendant Pushbutton Station: A pendant pushbutton station shall be provided, and shall have cast aluminum or a rubber-protected, corrosion-proofed metal case, pushbutton protectors, speed control buttons for all travel and hoisting directions, pilot light to indicate when system is energized, and switch to de-energize entire system. Pushbuttons shall be labeled and identified for motion control and compass direction of travel. The pendant shall be suspended from a minimum 3-foot long swiveling horizontal arm mounted on the trolley, with the bottom of the controller case 48-inches above the floor.

F. Limit Switches: The hoist shall be provided with suitable limit switches to stop the hoisting mechanism at the upper and lower limits of hook travel to prevent over travel of the hook and block, and an overload cutoff device capable of breaking the raising circuit at 110% of full load.

2.02 MANUFACTURERS

A. Electric monorail systems shall be supplied by one of the following, or equal:

1. Abell-Howe Company
2. ACCO Chain and Lifting Products Div. (Babcock Industries, Inc.)
3. American Monorail
4. Lift Tech International, Inc.
5. Thern, Inc. (Cal South Equipment Co.)
6. EDN Material Handling (Yale Hoists)

2.03 ACCESSORIES

A. Track Switches: Sliding switches or turntables shall be provided where indicated. All switches and turntables shall be of heavy-duty welded steel construction as manufactured by the monorail equipment manufacturer, with pull chains and

handles. Pull chains shall be located in such a way as not to interfere with the operation of the hoist. Switches shall be installed to accurately match up against the ends of the rails, with close tolerances. No cast fittings shall be used. The radius of curvature of tracks shall be not less than 48 inches, and it shall be large enough to prevent the hoist and trolley from binding.

PART 3 EXECUTION

3.01 GENERAL

A. All monorail equipment shall be installed in strict accordance with the manufacturer's published or written instructions and with Section 14600 - Hoists and Cranes, General, and shall comply with the requirements of State of California, Division of Occupational Safety and Health (DOSH).

B. The monorail shall be examined by an authorized certificating agent and the CONTRACTOR shall submit the certificate proving compliance with DOSH requirements.

END OF SECTION

SECTION 15000
GENERAL PIPING REQUIREMENTS AND APPURTENANCES

PART 1 GENERAL

1.01 SCOPE OF WORK

A. The Contractor shall provide all piping systems indicated, complete and operable, in accordance with the Contract Documents.

B. The mechanical drawings define the general layout, configuration, routing, method of support, pipe size, and pipe type. The mechanical drawings are not pipe construction or fabrication drawings. It is the Contractor's responsibility to develop the details necessary to construct all mechanical piping systems, to accommodate the specific equipment provided, and to provide and install all spools, spacers, adapters, supports, anchors, and connectors for a complete and functional system.

1.02 RELATED SECTIONS

A. Contract Documents are a single integrated document, and as such all Divisions and Sections apply. It is the responsibility of the Contractor and its Subcontractors to review all sections to ensure a complete and coordinated project.

1.03 CONTRACTOR SUBMITTALS

A. General:

1. Submittals shall be furnished in accordance with Specification Section 01300, "Submittals".

2. Contractor shall incorporate pothole information into the pipe layout drawings, showing the size, depth and station of each utility potholed.

B. Shop Drawings: Shop drawings shall contain the following information:

1. Layout drawings including all necessary dimensions, stations and inverts, details, pipe joints, fittings, specials, valves, appurtenances, anchors, supports, guides, and material lists.

2. Fabrication drawings shall indicate all spool pieces, spacers, adapters, connectors, fittings, and supports to accommodate the equipment and valves in a complete and functional system.

C. Samples: All expenses incurred in making samples for certification of tests shall be borne by the Contractor at no increase in cost to the City.

D. Certifications

1. All necessary certificates, test reports, and affidavits of compliance shall be obtained by the Contractor and shall be submitted to the Resident Engineer.

2. Fabricator Statement: A statement from the pipe fabricator certifying that all pipes will be fabricated subject to a recognized quality control program. An outline of the program shall be submitted to the Resident Engineer for review prior to the fabrication of any pipe.

1.04 DEFINITIONS OF BURIED AND EXPOSED PIPING

A. Buried piping is piping buried in the soil, commencing at the wall or beneath the slab of a structure. Where a coating is specified, provide the coating up to the structure wall. Unless detailed otherwise, coating shall penetrate wall no less than 1 inch. Piping encased in concrete is considered to be buried. Do not coat encased pipe.

B. Exposed piping is piping in any of the following conditions or locations:

1. Above ground.

2. Inside buildings, vaults, or other structures.

3. In underground concrete trenches or galleries.

PART 2 MATERIALS

2.01 GENERAL

A. Extent of Work: All pipes, fittings, and appurtenances shall be provided in accordance with the requirements of the applicable sections of Division 15 and as indicated.

B. Pipe Supports: All pipes shall be adequately supported, restrained, and anchored as indicated herein and on the Plans.

C. Pressure Rating: All piping systems shall be designed for the maximum expected test pressure.

D. Inspection: All pipe shall be subject to inspection at the place of manufacture. During the manufacture of the pipe, the Resident Engineer shall be given access to all areas where manufacturing is in progress and shall be permitted to make all inspections necessary to confirm compliance with requirements.

E. Tests: Except where otherwise indicated, all materials used in the manufacture of the pipe shall be tested in accordance with the applicable specifications and standards. The Contractor shall perform all tests at no additional cost to the City.

F. Welding Requirements: All welding procedures used to fabricate pipe shall be pre-qualified under the provisions of ANSI/AWS D1.1 - Structural Welding Code. Welding procedures shall be required for longitudinal and girth or spiral welds for pipe cylinders, spigot and bell ring attachments, reinforcing plates and ring flange welds, and plates for lug connections.

2.02 PIPE FLANGES

A. For Steel Pipe: Where the design pressure is 150 psi or less, flanges shall conform to ANSI/AWWA C207 - Steel Pipe Flanges for Waterworks Service—Sizes 4 inch through 144 inch, Class D.

1. Where the design pressure is greater than 150 psi up to a maximum of 275 psi, flanges shall conform to ANSI/AWWA C207 Class E.

2. AWWA flanges shall not be exposed to test pressures greater than 125 percent of rated capacity. For higher test pressures, the next higher rated AWWA flange shall be selected.

B. For Ductile Iron Pipe: Where the design pressure is 250 psi or less, use flat faced ductile iron flanges conforming to AWWA C115.

C. For Copper Pipe: Connect to flanged valves and fittings with bronze flanges conforming to ANSI B16.24, Class 125 or Class 150, to match the connecting flange. Use solder end companion flanges.

D. Blind Flanges: Blind flanges shall be of the same material as the mating flange. All blind flanges for pipe sizes 12 inches and larger shall be provided with lifting eyes in form of welded or screwed eye bolts.

E. Flange Coating: All machined faces of metal blind flanges and pipe flanges shall be coated with a temporary rust-inhibitive coating to protect the metal until the installation is completed.

F. Insulating Flanges: Insulated flanges shall have bolt holes 1/4-inch diameter greater than the bolt diameter.

G. Flange Insulation Kits: Flange insulation kits suitable for the design pressure of the pipeline shall be provided where shown on the drawings and shall be NSF/ANSI-61 certified. Materials for flange isolation kits on pipes containing water up to 280°F shall consist of the following components:

1. Isolating and Sealing Gasket

a) One full-faced isolating and sealing gasket, Type "E", 1/8" thick, G-10 epoxy glass retainer containing a precision tapered groove to accommodate the controlled compression of an EPDM quad-ring sealing gasket. Sealing gasket placement shall accommodate either flat, raised or RTJ face flanges. The G-10 retainer shall have 550 volts/mil dielectric strength and a minimum 50,000 psi

compressive strength. The full faced flange isolating gasket shall be 1/8" less in I.D. than the I.D. of the flange in which it is installed. Gasket shall be PSI LineBacker sealing gasket as manufactured by Pipeline Seal & Insulator, Inc.

2. Full Length Bolt Isolating Sleeves and Washers

a) One full length G-10 epoxy glass sleeve (extending half way into both stainless steel washers) for each flange bolt. The sleeve shall be a 1/32 inch thick tube with 400 volts/mil dielectric strength and water absorption of 0.1% or less.

Two, 1/8 inch thick, G-10 epoxy glass isolating washers for each bolt. Their compressive strength shall be 50,000 psi, dielectric strength 500 volts/mil and water absorption 0.1% or less.

Two, 1/8 inch thick Type 316 Stainless Steel washers for each bolt. The I.D. of all washers shall fit over the isolating sleeve and the stainless steel and isolating washers shall have the same I.D. and O.D.

3. Manufacturer

a) Flange isolating kits shall be manufactured at a facility that has a registered ISO 9001:2000 Quality Management System. Submittals shall include copy of valid registration. Kits shall be manufactured by Pipeline Seal and Insulator, Inc.

H. Flange Adapter Couplings: Restrained flange adapters shall be suitable for use with steel, ductile iron, and PVC pipe. Flanged adapters shall be made of ductile iron conforming to ASTM A536, have flange bolt circles that are compatible with AWWA C110, and be coated with fusion bonded epoxy. Restraint for flange adapter shall consist of a plurality of individual actuated gripping wedges to maximize restraint capability. Torque limiting actuating screws shall be used to insure proper initial set of gripping wedges. The flange adapters shall be capable of deflection during assembly or permit lengths of pipe to be field cut to allow a minimum 0.6 inch gap between the end of the pipe and the mating flange without affecting the integrity of the seal. Pressure ratings shall be equal to the pressure rating of the pipe. The flange adapter shall be the Series 2100 Megaflange Restrained Flange Adapter as produced by EBAA Iron, Inc. or approved equal.

I. Flange Gaskets: All gaskets shall have a thickness of 1/8-inch. For full-face gaskets, the gasket bolt hole pattern shall match the flange drilling pattern. The use of jointing compounds, release agents, lubricants, grease, or adhesives on either the gasket or flange faces is not allowed unless specifically recommended by the manufacturer. Manufacturer shall provide bolt torques required for each pipe diameter and working pressure. Gaskets shall meet the following requirements:

1. Working Pressure ≤ 150 psi

a) Gasket shall be full face, NSF-61 certified EPDM, and shall be in accordance with ANSI/AWWA C111/A21.11. Flanged gaskets shall have a rated working pressure of at least 150 psi and a rated maximum pressure of at least 200 psi, and shall have at least three (3) bulb type rings molded into both faces of the gasket to reduce bolting torque. Flanged gaskets shall be U.S. Pipe Full-Face Flange-Tyte Gasket, or approved equal.

2. Working Pressure > 150 psi up to 250 psi

a) Gasket shall be full-face type, NSF-61 certified, compressed non-asbestos synthetic fibers with an elastomeric binder, with a rated working pressure of at least 250 psi and a rated maximum pressure of at least 300 psi. Gasket shall be Garlock Multi-Swell Style 3760-U, or approved equal.

2.03 BOLTS AND NUTS FOR DUCTILE IRON OR STEEL FLANGES AND COUPLINGS

A. Bolts and nuts for flanges and couplings shall be Type 316 stainless steel conforming to Heavy Hex Head ASTM A 193 (Grade B8M) for bolts, and Heavy Hex Head ASTM A 194 (Grade 8M) for nuts. Nuts shall be coated using a three layer system consisting of a metallic base coat, an adhesion coat, and a heat cured fluoropolymer compound containing PTFE or TEFLON® as topcoat. Coating shall be FluoroKote#1 by Metal Coatings Corp., Tripac 2000 Blue Coating System by Tripac Fasteners, or approved equal.

B. Washers shall be provided for each nut, and shall be the same material and coating as the nut. Bolts shall extend through the nuts a minimum of 1/4-inch.

2.04 BOLTS AND NUTS FOR FLANGES ON COPPER TUBING

A. When both above ground adjoining flanges are bronze, use bronze bolts and nuts. Bolts shall conform to ASTM F 468, Grace C65100 or C63000. Nuts shall conform to ASTM F 467, Grade C65100 or C63000.

B. When only one of the aboveground adjoining flanges is bronze, use Type 316 stainless-steel bolts and nuts conforming to ASTM A 193 (Grade B8M) for bolts and ASTM A 194 (Grade 8M) for nuts.

C. Connect to buried ferrous flanges with flange insulation kits. Bolts used in flange insulation kits shall conform to ASTM B 193, Grade B7. Nuts shall comply with ASTM A 194, Grade 2H. If the adjoining buried flange is bronze, use bronze bolts and nuts as described above, without a flange insulation kit.

D. Provide washers for each nut. Washers shall be of the same material as the nuts.

2.05 LUBRICATION FOR STAINLESS STEEL NUTS AND BOLTS

A. Apply a liberal coat of a white food grade anti-seizing compound containing PTFE or Teflon to the threads of all stainless steel nuts and bolts, and to the face of all

washers. The compound shall have operating range covering -20°F to 440°F, be NSF approved (or meet USDA-H1 and FDA requirements for incidental food contact), suitable for use on stainless steel, with a coefficient of friction no greater than K=0.13. Compound shall be White-Knight as manufactured by Jet-Lube, or approved equal.

2.06 DIELECTRIC NIPPLES

A. Dielectric nipples shall create a dielectric waterway to inhibit galvanic corrosion between two dissimilar metals. Dielectric nipples shall be Schedule 40 carbon steel with plastic lining confirming to the requirements of ASTM A53 and ASTM F1545, and shall be coated in accordance with Specifications Section 09900, "Painting and Coating". Dielectric nipples shall be Victaulic Dielectric Waterway, or approved equal.

2.07 THREADED INSULATING CONNECTIONS

A. General: Threaded insulating bushings, unions, or couplings, as appropriate, shall be used for joining threaded pipes of dissimilar metals and for piping systems where corrosion control and cathodic protection are involved.

B. Materials: Threaded insulating connections shall be of nylon, Teflon, polycarbonate, polyethylene, or other non-conductive materials, and shall have ratings and properties to suit the service and loading conditions.

C. Couplings shall be Lochinvar V-line or equal.

2.08 SLEEVE-TYPE COUPLINGS

A. Construction: Sleeve-type couplings shall be provided where indicated, in accordance with ANSI/AWWA C219 - Standard for Bolted Sleeve-Type Couplings for Plain-End Pipe, and shall be of steel with Type 316 stainless steel bolts, without pipe stop, and shall be of sizes to fit the pipe and fittings indicated. The middle ring shall be not less than 1/4 inch in thickness and shall be either 5- or 7-inches long for sizes up to and including 30 inches and 10-inches long for sizes greater than 30 inches, for standard steel couplings, and 16-inches long for long-sleeve couplings. The followers shall be single-piece contoured mill sections welded and cold-expanded as required for the middle rings, and of sufficient strength to accommodate the number of bolts necessary to obtain adequate gasket pressures without excessive rolling. The shape of the follower shall be of such design as to provide positive confinement of the gasket. Buried sleeve-type couplings shall be epoxy-coated at the factory.

B. Pipe Preparation: The ends of the pipe where indicated, shall be prepared for flexible steel couplings. Plain ends for use with couplings shall be smooth and round for a distance of 12 inches from the ends of the pie, with outside diameter not more than 1/64-inch smaller than the nominal outside diameter of the pipe. The middle ring shall be tested by cold-expanding a minimum of 1 percent beyond the yield point, to proof-test the weld to the strength of the parent metal. The weld of the middle ring shall be subjected to air test for porosity.

C. Gaskets: Gaskets for sleeve-type couplings shall be rubber-compound material that will not deteriorate from age or exposure to air under normal storage or use conditions. Gaskets for wastewater and sewerage applications shall be Buna-N, Grade 60, or equivalent suitable elastomer. The rubber in the gasket shall meet the following specifications.

Property	Specification
Color	Jet black
Surface	Non blooming
Durometer Hardness	74+5
Tensile Strength	1000 psi minimum
Elongation	175 percent minimum

1. The gaskets shall be immune to attack by impurities normally found in water or wastewater. All gaskets shall meet the requirements of ASTM D 2000 - Classification System for Rubber Products in Automotive Applications, AA709Z, meeting Suffix B13 Grade 3, except as noted above. All gaskets shall be compatible with the piping service and fluid utilized.

D. Insulating Couplings: Where insulating couplings are required, both ends of the coupling shall have a wedge-shaped gasket that assembles over a rubber sleeve of an insulating compound in order to obtain insulation of all coupling metal parts from the pipe.

E. Restrained Joints: All sleeve-type couplings on pressure lines shall be harnessed or supplied with locking pins for restraint. Harnesses shall be in accordance with the appropriate reference standard, or as indicated.

1. Manufacturers, or approved equal, shall be:

a) EBAA Mega-Coupling Series 3800

b) Romac Style 400

c) Dresser, Style 38

d) Smith-Blair, Style 411

2.09 DISMANTLING JOINTS

A. The dismantling joints shall be self-contained flanged restrained joint fittings, consisting of flanged a spool piece, flange adapter, gasket, and sufficient tie rods to withstand the imposed thrust. The dismantling joints shall allow for a minimum of ±1 inch of longitudinal adjustment, be designed so that no part of the restraint system extends outside the flange diameter, and have an internal bore that matches that of the pipe system.

B. Flanges shall conform to AWWA C207. Gaskets shall be suitable for potable water service in accordance with ASTM D 2000. Tie rods, bolts, and nuts shall be Type 316 stainless steel. The dismantling joint shall be coated inside and out with fusion bonded epoxy.

C. The dismantling joint shall be Viking Johnson Dismantling Joint, Romac Style DJ400, Smith-Blair Model 975, or approved equal.

2.10 HOSE BIBBS

A. Hose bibbs of size 1/2 inch, 3/4 inch, and 1 inch shall be all bronze (ASTM B62 or ASTM B584, Alloy C83600) with rising stem, composition disc, bronze or malleable iron handwheel, and bronze stem (ASTM B99, Alloy C65100; ASTM B371, Alloy C69400; or ASTM B584, Alloy C87600). Packing shall be Teflon or graphite. Valves shall have a pressure rating of at least 125 psi for cold-water service. Threads on valve outlet shall be American National Standard fire hose coupling screw thread (ASME B1.20.7). Provide atmospheric vacuum breaker conforming to ASSE Standard 1011 and IAPMO code and approved by the State of California health department. Valves shall be Jenkins Figure 112, 113, or 372, Nibco Figure T-113-HC, Powell Figure 503H, or City approved equal.

PART 3 EXECUTION

3.01 GENERAL

A. All pipes, fittings, and appurtenances shall be installed in accordance with the requirements of AWWA and the applicable sections herein.

B. Lined Piping Systems: The lining manufacturer shall take full responsibility for the complete, final product and its application. All pipe ends and joints of lined pipes at screwed flanges shall be epoxy-coated to assure continuous protection.

C. Where core drilling is required for pipes passing through existing concrete, core drilling locations shall be determined by radiograph of concrete construction to avoid damage to embedded raceways and rebar.

D. Pipe for use with flexible couplings shall have plain ends as specified in the respective pipe sections.

E. Prior to assembly of split couplings, the grooves as well as other parts shall be thoroughly cleaned. The ends of the pipes and outside of the gaskets shall be moderately coated with petroleum jelly, cup grease, soft soap or graphite paste, and the gasket shall be slipped over one pipe end. After the other pipe has been brought to the correct position, the gasket shall be centered properly over the pipe ends with the lips against the pipes. The housing sections then shall be placed. After the bolts have been inserted, the nuts shall be tightened until the housing sections are firmly in contact, metal-to-metal, without excessive bolt tension.

F. Prior to the installation of sleeve-type couplings, the pipe ends shall be cleaned thoroughly for a distance of 8 inches. Soapy water may be used as a gasket

lubricant. A follower and gasket, in that order, shall be slipped over each pipe to a distance of about 6 inches from the end, and the middle ring shall be placed on the already laid pipe end until it is properly centered over the joint. The other pipe end shall be inserted into the middle ring and brought to proper position in relation to the pipe already laid.

The gaskets and followers shall then be pressed evenly and firmly into the middle ring flares. After the bolts have been inserted and all nuts have been made up finger-tight, diametrically opposite nuts shall be progressively and uniformly tightened all around the joint, preferably by use of a torque wrench of the appropriate size and torque for the bolts.

3.02 MATERIAL DELIVERY, STORAGE, AND PROTECTION

A. Delivery: All piping materials, fittings, valves, and accessories shall be delivered in a clean and undamaged condition. All defective or damaged materials shall be replaced with new materials.

B. Onsite Storage Limitation: Onsite storage shall be limited to working areas unless exception is approved by the Resident Engineer.

C. Care of Pipe: Care shall be taken to avoid cracking of the cement mortar coating and/or lining on steel pipe. Plastic sheet caps shall be used to close pipe ends and keep coating and linings moist.

D. Stored pipe shall at all times be supported on sawdust bags, sand bags, or other suitable support. Bags shall be of sufficient size to prevent contact of the pipe coating with the ground or any other obstruction. Rolling the pipe on the ground will not be permitted.

3.03 HANDLING OF PIPE AND FITTINGS

A. Pipe shall be transported from the plant to the job site on padded bunks with nylon tie-down straps or padded banding to adequately protect the pipe and coating.

B. Each section of pipe 20 inches in diameter and larger, including bends and special fittings, shall be protected from undue deformation during handling, transportation and installation by proper internal bracing. The bracing shall be placed near each end of the pipe and at suitable intervals between the end bracings, as required to prevent the pipe from exceeding 1.0 percent deformation measured on the pipe diameter. Such 1.0 percent deformation shall be a total combination of pipe deflection and the pipe manufacturer's tolerances, in accordance with AWWA C200, AWWA C205, AWWA C151, and AWWA C110, as applicable.

C. Bracing shall have a minimum of six points of bearing on the pipe and shall be fitted to the curvature of the interior pipe surface and shall be wedged against the mortar lining in a manner that will secure the bracing during handling, installation and backfilling and shall also prevent damage of the interior lining. All internal bracing shall remain in place until the pipe has been installed and backfilled, or until its removal is otherwise authorized by the Resident Engineer.

D. Pipe shall be handled, stored and shipped in a manner that will prevent damage to the coating and lining. Pipe shall be handled with wide belt slings or rubber padded forklifts. Chains, cables or other equipment likely to cause damage to the pipe or coating shall not be used.

E. No metal tools or heavy objects shall be permitted to come into contact unnecessarily with the finished coatings and linings. Workmen will be permitted to walk upon the coating only when necessary, in which case they shall wear shoes with rubber or composition soles and heels. All pipe and fittings, specials and couplings shall be examined before laying and no piece shall be installed that is found to be defective. Any damage to the coatings and linings shall be repaired as acceptable to the Resident Engineer.

F. If any defective pipe is discovered after it has been laid, it shall be removed and replaced with a sound pipe in a satisfactory manner by the Contractor, at his own expense.

G. Fittings shall be lowered into trench by means of rope, cable, chain, or other acceptable means without damage to the fittings. Cable, rope, or other devices used for lowering fitting into trench shall be attached around exterior of fitting for handling. Under no circumstances shall the cable, rope or other device be attached through the fittings interior for handling. Fittings shall be carefully connected to pipe or other facility, and joints shall be checked to ensure a sound and proper joint.

3.04 PLACEMENT OF PIPE IN TRENCH

A. General: Dewatering, excavation, shoring, sheeting, bracing, backfilling material placement, material compaction, compaction testing, and pipe laying requirements and limitations shall be in accordance with Section 306.

B. Sanitation of Pipe Interior: During laying operations, tools, clothing, or other materials shall not be placed in or allowed in the pipe.

C. Prevention of Entry into Pipe: When pipe laying is not in progress, including lunch-hour, the ends of the pipe shall be closed using vermin-proof plugs constructed in a manner to also prevent entry by children.

D. Laying Pipe on Grades over 10 Percent: Pipes shall be laid in an upgradient direction whenever the grade exceeds 10 percent.

E. Depressions at Joints and Pipe Sling Points: Depressions shall be dug into pipe base material to accommodate the pipe bell and external joint filler form, and to permit removal of the pipe handling slings.

F. Placement of Pipe on Pipe Base: Pipe shall be lowered onto the bedding and installed to line and grade its full length on firm bearing except at the bell and at sling depressions. Unless specified otherwise, the tolerance on grade shall be 1/4 inch; the tolerance on line shall be 1 inch. Grade shall be measured along the pipe invert.

G. Pipe Installation: Pipe shall be installed without springing, forcing, or stressing the pipe or any adjacent connecting valves or equipment. Precaution shall be taken to prevent pipe from being displaced by water entering trench. Damaged or displaced pipe shall be replaced or returned to specified condition and grade.

H. Pipe Deflection: The deflection at any flexible joint shall not exceed that prescribed by the manufacturer of the pipe. The manufacturer's printed installation guide outlining the radius of curvature that can be negotiated with pipe sections of various lengths shall be followed.

I. Equipment for Installation of Pipe: Proper implements, tools, and facilities as recommended by the pipe manufacturer's standard printed installation instructions shall be provided and used by the Contractor for safe and efficient execution of the work. All pipe, fittings, valves, and accessories shall be carefully lowered into the trench using suitable equipment in such a manner as to prevent damage to pipe and fittings. Under no circumstances shall pipe or accessories be dropped or dumped into the trench.

J. Cutting and Machining Pipe: Cutting and machining of the pipe shall be accomplished in accordance with the pipe manufacturer's standard procedures for this operation. Pipe shall not be cut with a cold chisel, standard iron pipe cutter, or any other method that may fracture the pipe or produce ragged, uneven edges.

3.05 COMPLETING OF INTERIOR JOINTS FOR CEMENT MORTAR LINED PIPES

A. Interior pipe joint sealant shall be used on all CML&C steel pipe less than 24-inches in diameter; the sealant shall be Product No. GS-79 manufactured by General Sealants Corporation.

B. Interior of all joints shall be coated with a sufficient amount of cement mortar to fill the space between adjacent mortar linings of the two pipes to be joined and finished smooth with a steel trowel to match the adjoining pipes.

C. Excess mortar and other construction debris shall be removed from the interior.

3.06 COMPLETION OF EXTERIOR PIPE JOINT FOR CEMENT MORTAR COATED PIPE

A. Outside joint recess shall be filled with cement-mortar grout using a fabric form placed around the joint and secured with steel straps. Grout shall be poured and rodded from one side only until it is visible on the opposite side. After approximately 1 hour, the joint shall be topped off with additional grout.

3.07 PIPELINE CLOSURE ASSEMBLIES

A. General: Pipeline closure assemblies shall be employed to unite sections of pipeline laid from opposite directions; to adjust the field length of the pipeline to meet structures, other pipelines, and points established by design stations; and to close areas left open to accommodate temporary test bulkheads for hydrostatic testing. Either follower ring design or butt strap design shall be used. Follower ring closures shall be installed as recommended by the pipe manufacturer.

B. Butt Straps: For steel pipe, shaped steel butt straps shall be centered over the ends of the pipe sections they are to join. Butt straps shall be welded to the outside of the pipes with complete circumferential fillet welds equal in size to the thinnest part being joined. All butt strap welds shall be double pass welds for the entire circumference.

C. General Requirements for Cement Mortar Lining for Closure Assemblies: Closure assemblies shall be cement-mortar lined to a mortar thickness at least equal to the adjoining standard pipe sections. The steel or ductile iron shall be cleaned with wire brushes and a cement and water wash coat applied prior to applying the cement mortar. Where more than a 4-inch joint strip of mortar is required, welded wire mesh reinforcement having a 2-inch by 4-inch pattern of No. 13 gauge shall be placed over the exposed surface. The mesh shall be installed so that the wires on the 2-inch spacing run circumferentially around the pipe. The wires on the 4-inch spacing shall be crimped to support the mesh 3/8 inch from the metal surface. The interior mortar shall have a steel-troweled finish to match adjoining mortar lined pipe sections.

D. Mortar Coating Exterior Surfaces of Closure Assemblies: The exterior of closure assemblies shall be reinforced with wire mesh as described in Paragraph C above. The surface shall be coated with mortar, or a poured concrete encasement to cover all steel to a minimum thickness of 1-1/2 inches. Exterior mortar shall be protected to retard drying while curing. Concrete shall be poured and vibrated on one side of the closure assembly only, until mortar is visible on the opposite side, after which the coating can be completed over the top of the assembly.

3.08 FLANGED CONNECTIONS

A. Bolthole Alignment: Pipe shall be set with flange boltholes straddling the pipe horizontal and vertical centerlines. Before bolting up, align flange faces to the design plane within 1/16 inch per foot measured across any diameter. Align flange bolt holes within 1/8-inch maximum offset.

B. Nuts and Bolts: Nuts and bolts shall be lubricated graphite prior to installation.

C. Flange Wrapping: Flanges that connect with buried valves or other equipment shall be wrapped with sheet polyethylene film as specified for the valves and equipment. The wrap shall be extended over the flanges and bolts and secured around the adjacent pipe circumference with tape.

D. Coating: Flanges and stainless steel bolts shall be completely coated as specified in Specification Section 09900, "Painting and Coating".

3.09 INSTALLING BLIND FLANGES

A. At outlets not indicated to be connected to valves or to other pipes and to complete the installed pipeline hydrostatic test, provide blind flanges with bolts, nuts, and gaskets.

B. Coat the inside face of blind flanges per Specification Section 09900, "Painting and Coating", System No. 7.

3.10 BLOW-OFF ASSEMBLIES

A. General: In-line type or end-of-line type blow-off assemblies shall be installed in accordance with the Drawings at the locations noted.

B. Location: The assembly shall be installed in a level section of pipe. The tap for blow-off in the line shall be no closer than 12 inches to a valve, coupling, joint, or fitting unless it is at the end of the main.

3.11 WARNING TAPE

A. Warning tape shall be 6-inch wide detectable tape, with a minimum 5.0 mil overall thickness. Tape shall be manufactured using a 0.8 mil clear virgin polypropylene film, reverse printed and laminated to a 0.35 mil solid aluminum foil core, and then laminated to a 3.75 mil clear virgin polyethylene film. Tape shall meet the APWA Uniform Color Code for identification of buried utilities. Tape legends shall be standard stock (non-custom) where possible. Warning tape shall be installed at the top of the pipe zone over the entire pipe length of all buried pipes.

B. Tape for potable water pipelines shall be blue with black lettering, with the following legend: "CAUTION WATER LINE BURIED BELOW."

C. Tape for sewer pipelines shall be green with black lettering, with the following legend: "CAUTION SEWER LINE BURIED BELOW."

3.12 REQUIRED CATHODIC PROTECTION TESTING AND RECORD KEEPING

A. The Contractor shall furnish all necessary equipment, material and qualified personnel required to perform all tests described herein.

1. Continuity Tests: The Contractor shall notify the Resident Engineer when continuity bonding has been completed and all test boxes have been completed. A registered corrosion engineer retained by the Contractor shall test and measure the electrical continuity of metallic pipelines. The pipeline shall be considered electrically continuous when the measured longitudinal resistance of the pipeline between each pair of adjacent test stations is no greater than 20 percent higher than the theoretical resistance of that section of pipeline.

   a) If tests indicate that adequate electrical continuity has not been achieved the Contractor, at its own expense, shall excavate to investigate and locate improperly bonded joints and shall make repairs until electrical continuity is achieved to the satisfaction of the Resident Engineer.

2. Test Stations: The Contractor shall notify the Resident Engineer when insulator test box wires are ready for testing. The wires shall remain

disconnected to facilitate testing. A registered corrosion engineer retained by the Contractor shall conduct the tests to certify that none of the wires were damaged or broken during the installation. If tests indicate damage, the entire wire shall be replaced and retested at the Contractor's expense.

a) Records shall be made of all test stations and shall be submitted to the Resident Engineer.

3. Insulation Joints: The Contractor shall test each insulated joint with the insulator tester in accordance with the manufacturer's written instructions. All damaged or defective insulation parts shall be replaced and retested.

a) Records shall be kept of all insulated joint tests and shall be submitted to the Resident Engineer.

4. Acceptance: The Contractor shall submit a certified report by the corrosion engineer stating that the facilities are performing satisfactorily. All tests made must be reviewed and approved by the Resident Engineer before the work is accepted. The Resident Engineer reserves the right to spot check any or all tests performed by the Contractor. All construction defects must be repaired and retested before final acceptance is made. All unacceptable tests must be re-performed by the Contractor at no additional cost to the City. Contractor shall connect all lead wires after testing is completed.

3.13 CLEANUP

A. After completion of the work, all remaining pipe cuttings, joining and wrapping materials, and other scattered debris shall be removed from the site. The entire piping system shall be handed over in a clean and functional condition.

END OF SECTION

SECTION 15010
VALVE INSTALLATION

PART 1 GENERAL

1.01 SCOPE

A. This section covers the installation of new valves and actuators purchased by Contractor as part of this Work and covered by the Whitebook or these technical specifications.

B. Cleaning, disinfection, pressure and leakage testing, insulation, and pipe supports are covered in other sections.

1.02 GENERAL

A. Equipment installed under this section shall be erected and placed in proper operating condition in full conformity with drawings, specifications, engineering data, instructions, and recommendations of the equipment manufacturer, unless exceptions are noted by Resident Engineer.

B. Coordination. When manufacturer's field services or installation check services are provided by the valve manufacturer, Contractor shall coordinate the services with the valve manufacturer. Contractor shall give Resident Engineer written notice at least 30 days prior to the need for manufacturer's field services.

C. Flanged connections to valves including the bolts, nuts, and gaskets are covered in the appropriate pipe specification section.

1.03 DELIVERY, STORAGE, AND HANDLING

A. Storage. Upon delivery, all equipment and materials shall immediately be stored and protected by Contractor in accordance with Specification Section 01614, "Handling and Storage" and the manufacturer's instructions until installed in the Work. Stored equipment shall be protected by Contractor against damage and exposure from the elements. At no time shall the equipment be stored on earth or grass surfaces or come into contact with earth or grass. Contractor shall keep the equipment dry at all times.

PART 2 MATERIALS - (NOT USED)

PART 3 EXECUTION

3.01 INSPECTION

A. All valves and accessories shall be inspected for damage and cleanliness before being installed. Any material damaged or contaminated in handling on the job shall not be used unless it is repaired and re-cleaned to the original requirements by Contractor. Such material shall be segregated from the clean material and shall be inspected and approved by City or his representative before its use.

3.02 INSTALLATION

A. General. Valves shall be installed with sufficient clearance for proper operation of any external mechanisms, and with sufficient clearance to dismantle the valve for in-place maintenance. Installation shall be in accordance with the valve manufacturer's recommendations.

Unless otherwise indicated on the drawings, all valves installed in horizontal runs of pipe having centerline elevations 4 feet 6 inches or less above the finish floor shall be installed with their operating stems vertical. Valves installed in horizontal runs of piping having centerline elevations between 4 feet 6 inches and 6 feet 9 inches above the finish floor shall be installed with their operating stems horizontal. If adjacent piping prohibits this, the stems and operating handwheel shall be installed above the valve horizontal centerline as close to horizontal as possible. Valves installed in vertical runs of pipe shall have their operating stems oriented to facilitate the most practicable operation, as reviewed by Resident Engineer.

B. Installation Checks. When specified in the valve sections, the valve manufacturer will provide installation checks. For installation checks, the manufacturer's field representative will inspect the valve installation immediately following installation by Contractor. The manufacturer's representatives will revisit the site as often as necessary to ensure installation satisfactory to City.

Contractor shall perform no Work related to the installation or operation of materials or equipment furnished by others without direct observation and guidance of the field representative, unless Resident Engineer and manufacturer furnishing such materials concur otherwise.

C. AWWA Butterfly Valves. Butterfly valves shall be installed with the shaft horizontal unless otherwise necessary for proper operation or as acceptable to Resident Engineer.

Whenever an actuator must be removed to permit installation of a valve, the actuator shall be promptly reinstalled and shall be inspected and readjusted by a representative of the valve manufacturer.

D. Resilient Seated Gate Valves. Valves shall be handled and installed in accordance with the recommendations set forth in the Appendix to ANSI/AWWA C509 and with the recommendations of the manufacturer.

E. Air Release and Combination Air Valves. The exhaust from each valve shall be piped to a suitable point acceptable to Resident Engineer. Air release valve exhaust piping leading to a trapped floor drain shall terminate at least 6 inches above the floor.

F. Valve Boxes. Valve boxes shall be set plumb. Each valve box shall be placed directly over the valve it serves, with the top of the box brought flush with the finished grade. After each valve box is placed in proper position, earth fill shall be placed and thoroughly tamped around the box.

G. Fire Hydrants. Fire hydrants shall be set so that at least the minimum pipe cover is provided for the branch supply line and the nozzles are at least 12 inches above finished grade. Each hydrant shall be set on a concrete foundation and set plumb as shown on the standard drawing.

Immediately before installation of a fire hydrant, the following procedure shall be followed: (a) the hydrant shall be thoroughly inspected; (b) the hydrant interior shall be thoroughly cleaned; and (c) the hydrant shall be opened and closed as many times as may be necessary to determine if all parts are in proper working order, with valves seating properly and the drain valve operating freely.

3.03 VALVE ACTUATORS

A. Valve actuators and accessories shall be installed in accordance with the equipment manufacturer's recommendations. Location and orientation of valve actuators shall be approved by the City prior to installation.

3.04 FIELD QUALITY CONTROL

A. Field Testing. After installation, all valves shall be tested in conjunction with hydrostatic testing of pressure pipelines.

B. Leakage Tests. All valves shall be free from leaks. Each leak that is discovered within the Warranty and Guarantee period stipulated in the General Conditions shall be repaired by and at the expense of Contractor. This requirement applies whether pressure testing is required or not.

3.05 ADJUSTING

A. After installation, the opening and closing time shall be adjusted as needed for each hydraulic and electric actuated valve.

END OF SECTION

SECTION 15020
MISCELLANEOUS PIPING AND ACCESSORIES INSTALLATION

PART 1 GENERAL

1.01 SCOPE

A. This section covers the installation of piping and accessories as indicated on the drawings for the following piping sections:

Section	Description
15060	Miscellaneous Piping and Pipe Accessories
15066	Stainless Steel Pipe, Tubing, and Accessories
15067	Miscellaneous Plastic Pipe, Tubing, and Accessories
15068	Miscellaneous Steel Pipe, Tubing, and Accessories
15070	Copper Tubing and Accessories

B. Contractor shall furnish all necessary jointing materials, coatings, and accessories that are specified herein.

1.02 GENERAL

A. Coordination. Materials installed under this section shall be installed in full conformity with drawings, specifications, engineering data, instructions, and recommendations of the manufacturer, unless exceptions are noted by Resident Engineer.

1.03 SUBMITTALS.

A. Drawings and Data. Complete specifications, data, and catalog cuts or drawings shall be submitted in accordance with the Submittals section. Items requiring submittals shall include, but not be limited to, the following:

1. Cleaning procedure for metal chlorine piping.

2. Watertight/dust tight pipe sleeves.

3. Materials and Certificates of Compliance as specified herein.

B. Welder Certification. Prior to the start of the work, Contractor shall submit a list of the welders he proposes using and the type of welding for which each has been qualified. Copy of certification and identification stamp shall be submitted for each welder. Qualification tests may be waived if evidence of prior qualification is deemed suitable by Resident Engineer.

C. Spool Drawings. Spool drawings indicating the complete line, showing all welded and assembly items, except for insulation shoes or nonstress-relieved lines, shall be developed and submitted for the following services:

1. Pump Station Yard Piping

1.04 QUALITY ASSURANCE

A. Welding and Brazing Qualifications. All welding and brazing procedures and operators shall be qualified by an independent testing laboratory in accordance with the applicable provisions of Section IX of the ASME Code. All procedure and operator qualifications shall be in written form and subject to Resident Engineer's review. Accurate records of operator and procedure qualifications shall be maintained by Contractor and made available to Resident Engineer upon request.

B. Tolerances. These tolerances apply to in-line items and connections for other lines.

1. The general dimension, such as face-to-face, face or end-to-end, face- or end-to center, and center-to-center shall be 1/8 inch.

2. The inclination of flange face from true in any direction shall not exceed 3/64 inch per foot.

3. Rotation of flange bolt holes shall not exceed 1/16 inch.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Shipping shall be in accordance with Specification Section 01612, "Shipping". Handling and storage shall be in accordance with Specification Section 01614, "Handling and Storage". All materials shall be stored in a sheltered location above the ground, separated by type, and shall be supported to prevent sagging or bending.

B. Coated Pipe. Handling methods and equipment used shall prevent damage to the protective coating and shall include the use of end hooks, padded calipers, and nylon or similar fabric slings with spreader bars. Bare cables, chains, or metal bars shall not be used. Coated pipe shall be stored off the ground on wide, padded skids. Plastic-coated pipe shall be covered or otherwise protected from exposure to sunlight.

PART 2 PRODUCTS

2.01 SERVICE CONDITIONS

A. Pipe, tubing, and fittings covered herein shall be installed in the services indicated in the various pipe sections.

2.02 MATERIALS

A. PIPING

Threaded Fittings	
Anti-Seize Thread Lubricant	Jet-Lube "Nikal", John Crane "Thred Gard Nickel", Never-Seez "Pure Nickel Special", or Permatex "Nickel Anti-Seize".
Teflon Thread Sealer	Paste type; Hercules "Real-tuff", John Crane "JC-30", or Permatex "Thread Sealant with Teflon".

Teflon Thread Tape	Hercules "Tape Dope" or John Crane "Thread-Tape".
Solvent Welded Fittings	
Solvent cement for PVC Systems	ASTM D2564.
Primer for PVC Systems	ASTM F656.
Solder or Brazed Fittings	
Solder	Solid wire, ASTM B32, ANSI/NSF 61 certified, Alloy Grade Sb5, (95-5).
Soldering Flux	Paste type, ASTM B813.
Brazing Filler Metal	AWS A5.8, BCuP-5; Engelhard "Silvaloy 15", Goldsmith "GB-15", or Handy & Harman "Sil-Fos".
Brazing Flux	Paste type, Fed Spec O-F-499, Type B.
Insulating Fittings	
Threaded	Dielectric steel pipe nipple, ASTM A53, Schedule 40, polypropylene lined, zinc plated; Perfection Corp. "Clearflow Fittings".
Flanged	Epco "Dielectric Flange Unions" or Central Plastics "Insulating Flange Unions".
Pipe Insulation	See Mechanical Insulation section.
Watertight/Dusttight Pipe Sleeves	O-Z Electrical Manufacturing "Thruwall" and "Floor Seals", or Thunderline "Link-Seals"; with modular rubber sealing elements, nonmetallic pressure plates, and galvanized bolts.
Pipe Sleeve Sealant	Polysulfide or urethane, as specified in the Caulking section or as indicated on the drawings.
Protective Coatings	
Tape Wrap	ANSI/AWWA C209, except single ply tape thickness shall not be less than 30 mils Protecto Wrap "200" or Tapecoat "CT".
Primer	As recommended by the tape manufacturer.
Coal Tar Epoxy	High-build coal tar epoxy; Ameron "Amercoat 78HB Coal Tar Epoxy", Carboline "Bitumastic 300 M", Tnemec "46H-413 Hi-Build Tneme-Tar", or Sherwin-Williams "Hi-Mil Sher-Tar Epoxy".

B. FABRICATED STEEL SLEEVES

1. Provide fabricated steel sleeves with ends as shown in the drawings for containing pipes where they pass through concrete walls. Provide seepage ring or wall flange on wall pipes and sleeves passing through concrete walls and slabs that are to be watertight. Wall thickness shall be the same as the pipe wall thickness when connecting to steel pipe. Minimum wall thickness for sleeves containing pipes shall be standard weight per ASME B36.10.

2. Wall flanges shall be in the form of a steel wall collar welded to the steel sleeve or penetration. Cut welded wall collars from a 1/4-inch steel ring.

Attach the collar to a steel wall pipe or sleeve with full circle, 3/16-inch fillet welds. Welding procedures shall be in accordance with ASME B31.3, Chapter V.

3. Steel pipe used in fabricating wall sleeves containing pipes shall comply with ASTM A53 (Type E or S), Grade B; ASTM A135, Grade B; ASTM A139, Grade B; or API 5L or 5LX.

4. Pressure test at least one of each size of fabricated steel wall sleeve or penetration and collar assemblies at the place of fabrication to demonstrate watertightness of the seal between the collar and the sleeve. The test shall be at a pressure of 20 psig for four hours' duration and shall show zero leakage.

C. Rubber Annular Hydrostatic Sealing Devices

1. Rubber annular hydrostatic sealing devices shall be of the modular mechanical type, utilizing interlocking synthetic rubber links shaped to continuously fill the annular space between the pipe sleeve and the passing pipe. Assemble links to form a continuous rubber belt around the pipe, with a pressure plate under each bolthead and nut.

2. Materials of construction shall be as follows:

Compound	Material
Pressure plate	Type 316 stainless steel
Bolts and nuts for links	Type 303 or 316 stainless steel
Sealing element	EPDM rubber

3. The size of the wall sleeve needed to accommodate the passing pipe shall be as recommended by the rubber annular seal manufacturer.

4. Provide centering blocks in 25% of the sealing elements on pipelines larger than 12 inches in diameter.

5. The rubber annular hydrostatic sealing devices shall be Link Seal as manufactured by Thunderline Corporation; Innerlynx as manufactured by Advance Products & Systems, Inc.; or equal.

D. POLYETHYLENE FOAM FILLER FOR PIPE PENETRATIONS

1. Packing foam shall be an extruded closed-cell polyethylene foam rod, such as Minicel backer rod, manufactured by Industrial Systems Department, Plastic Products Group of Hercules, Inc., Middletown, Delaware; Ethafoam, as manufactured by Dow Chemical Company, Midland, Michigan; or equal. The rod shall be 1/2 inch larger in diameter than the annular space.

E. POLYURETHANE SEALANT FOR PIPE PENETRATIONS

1. Sealant shall be multipart, polyurethane sealant, to cure at ambient temperature, for continuous immersion in water. Install as recommended by the manufacturer. Products: SIKA Sikaflex 2C or equal.

PART 3 EXECUTION

3.01 INSPECTION

A. All piping components shall be inspected for damage and cleanliness before being installed. Any material damaged or contaminated in handling on the job shall not be used unless it is repaired and recleaned to the original requirements by Contractor. Such material shall be segregated from the clean material and shall be inspected and approved by City or his representative before its use.

3.02 PREPARATION

A. Field Measurement. Pipe shall be cut to measurements taken at the site, not from the drawings. All necessary provisions shall be made in laying out piping to allow for expansion and contraction. Piping shall not obstruct openings or passageways. Pipes shall be held free of contact with building construction to avoid transmission of noise resulting from expansion.

3.03 INSTALLATION

A. General. All instruments and specialty items shall be installed according to the manufacturer's instructions and with sufficient clearance and access for ease of operation and maintenance.

1. Flat faced wrenches and vises shall be used for copper tubing systems. Pipe wrenches and vises with toothed jaws will damage copper materials and shall not be used. Bends in soft temper tubing shall be shaped with bending tools.

B. Pipe Sleeves. Piping passing through concrete or masonry shall be installed through sleeves that have been installed before the concrete is placed or when masonry is laid. Unless otherwise indicated on the drawings, in locations where pipes pass through floors, pipe sleeves shall project not less than 1 inch nor more than 2 inches above the floor surface, with the projections uniform within each area. In the case of insulated pipes, the insulation shall extend through pipe sleeves. Where the drawings indicate future installation of pipe, sleeves fitted with suitable plastic caps or plugs shall be provided.

1. Holes drilled with a suitable rotary drill will be considered instead of sleeves for piping which passes through interior walls and through floors with a special finish.

2. Unless otherwise indicated on the drawings, all pipes passing through walls or slabs which have one side in contact with earth or exposed to the weather shall be sealed watertight with special rubber-gasketed sleeve and joint assemblies, or with sleeves and modular rubber sealing elements.

3. Piping passing through locations as required shall be made dusttight and gastight with special rubber-gasketed sleeve and joint assemblies; with sleeves sealed with modular rubber sealing elements; or by caulking with oakum and polysulfide or urethane sealant.

C. Pipe Joints. Pipe joints shall be carefully and neatly made in accordance with the indicated requirements.

1. Threaded. Pipe threads shall conform to ANSI/ASME B1.20.1, NPT, and shall be fully and cleanly cut with sharp dies. Not more than three threads at each pipe connection shall remain exposed after installation. Ends of pipe shall be reamed after threading and before assembly to remove all burrs. Unless otherwise indicated, threaded joints shall be made up with teflon thread tape, thread sealer, or a suitable joint compound.

   a) Threaded joints in plastic piping shall be made up with teflon thread tape applied to all male threads. Threaded joints in stainless steel piping shall be made up with teflon thread sealer and teflon thread tape applied to all male threads. Threaded joints in steel piping for chlorine service shall be made up with teflon thread tape or litharge and glycerine paste applied to all male threads.

2. Soldered and Brazed. Where solder fittings are specified for lines smaller than 2 inches, joints may be soldered or brazed at the option of Contractor. Joints in 2 inch and larger copper tubing shall be brazed. Brazing alloy shall contain no tin. Joints in copper chlorine tubing and refrigerant piping shall be brazed; solder will not be acceptable.

   a) Surfaces to be joined shall be thoroughly cleaned with flint paper and coated with a thin film of flux. At each joint, tubing shall enter to the full depth of the fitting socket.

   b) Care shall be taken to avoid overheating the metal or flux. Each joint shall be uniformly heated to the extent that filler metal will melt on contact. While the joint is still hot, surplus filler metal and flux shall be removed with a rag or brush.

3. Flanged. Flange bolts shall be tightened sufficiently to slightly compress the gasket and effect a seal, but shall not be torqued less than the minimum value required by the gasket manufacturer. Flange bolts shall not be so tight as to fracture or distort the flanges. A plain washer shall be installed under the head and nut of bolts connecting plastic pipe flanges. Anti-seize thread lubricant shall be applied to the threaded portion of all stainless steel bolts during assembly.

   a) Flange bolt holes shall be oriented as follows, unless otherwise indicated on the spool drawings:

      i) Vertical flange face: Bolt holes to straddle the vertical centerlines.

ii) Horizontal flange face: Bolt holes to straddle plant north-south centerlines.

b) Pipe sealants, thread compounds, or other coatings shall not be applied to flange gaskets unless recommended by the gasket manufacturer for the specified service and approved by Resident Engineer.

c) Welds at orifice flanges shall have internal surfaces ground smooth to the pipe wall.

d) Slip-on flanges shall be welded inside and outside. There shall be a distance of approximately 1/16 to 1/8 inch between the edge of the fillet weld and the face of the flange. The seal weld shall be applied so that the flange face shall be free of weld spatter and does not require refacing.

e) Flat-faced flanges shall be used when mating to Class 125 flanges. Full-face gaskets shall be used with flat-faced flanges and ring gaskets shall be used with raised faced flanges.

f) Weld neck flanges shall be used with butt-weld fittings. The bore of weld neck flanges shall match the pipe wall thickness.

g) Insulating joints connecting submerged (buried) piping to exposed piping shall be installed above the maximum water surface elevation and before the first pipe support not having coated anchor bolts or adhesive-bonded concrete anchors. All submerged (buried) metallic piping shall be isolated from the concrete reinforcement. Insulating flanges shall be tested for electrical isolation after installation and bolt-up but prior to introduction of conducting fluid.

4. Welded. Welding shall conform to the specifications and recommendations contained in the "Code for Pressure Piping", ANSI B31.1.

a) Weld cross-sections shall be equal to or greater than the pipe wall thickness. Welds shall be smooth and continuous and shall have interior projections no greater than 1/16 inch. Backing strips or rings shall not be used except with specific prior review by Resident Engineer as to use, material, and design. Root gap inserts that are completely melted and consumed in the weld bead are acceptable only when reviewed in advance by Resident Engineer.

b) Stainless steel welding shall be inert gas tungsten arc (TIG) or the direct current, straight polarity, inert gas metal arc process (MIG).

c) Carbon steel welding shall be made by the shielded metal arc process.

5. Grooved Couplings. Grooves for grooved couplings shall be cut with a specially designed grooving tool. Grooves cut in steel pipe shall conform to flexible grooving dimensions, as set forth in AWWA C606, and shall be clean and sharp without burrs or check marks.

6. Push-on. Gasket installation and other jointing procedures shall be in accordance with the recommendations of the manufacturer. Each spigot end shall be suitably beveled to facilitate assembly. All joint surfaces shall be lubricated with a heavy vegetable soap solution immediately before the joint is completed. Lubricant shall be suitable for use in potable water, shall be stored in closed containers, and shall be kept clean.

D. Pipe. Pipe shall be installed as specified, as indicated on the drawings, or, in the absence of detail piping arrangement, in a manner acceptable to Resident Engineer.

1. Piping shall be installed without springing or forcing the pipe in a manner which would induce stresses in the pipe, valves, or connecting equipment.

2. Piping shall be supported in conformance with the Pipe Supports section.

3. Piping shall be connected to equipment by flanges or unions as specified in the various piping sections. Piping connecting to equipment shall be supported by a pipe support and not by the equipment.

4. Water piping shall be provided with a shutoff valve and union at each fixture or unit of equipment, whether or not indicated on the drawings, to permit isolation and disconnection of each item without disturbing the remainder of the system.

5. A union shall be provided within 2 feet of each threaded-end valve unless there are other connections which will permit easy removal of the valve. Unions shall also be provided in piping adjacent to devices or equipment which may require removal in the future and where required by the drawings or the specifications.

6. Water supply piping within structures shall be arranged, and facilities provided, for complete drainage. All piping serving metering equipment shall be uniformly graded so that air traps are eliminated and complete venting is provided.

7. Taps for pressure gauge connections on the suction and discharge of pumping units shall be provided with a nipple and a ball type shutoff valve.

8. Drilling and tapping of pipe walls for installation of pressure gauges or switches will not be permitted.

9. In all piping, insulating fittings shall be provided to prevent contact of dissimilar metals, including but not limited to, contact of copper, brass, or bronze pipe, tubing, fittings, valves, or appurtenances, or stainless steel

pipe, tubing, fittings, valves, or appurtenances with iron or steel pipe, fittings, valves, or appurtenances. Insulating fittings shall also be provided to prevent contact of copper, brass, or bronze pipe, tubing, fittings, valves or appurtenances with stainless steel pipe, tubing, fittings, valves, or appurtenances.

10. Buried PVC piping shall be "snaked" in the trench and shall be kept as cool as possible during installation. PVC pipe shall be kept shaded and shall be covered with backfill immediately after installation.

11. Piping adjacent to flow sensors shall be installed in accordance with the requirements of the manufacturer of the flow sensor and commonly accepted design practices of the appropriate straight pipe runs both upstream and downstream.

12. Drains required for operation are shown on the drawings. However, vents at all high points and drains at all low points in the piping that are required for complete draining for pressure test may not be shown on these drawings. Contractor shall add such items as found to be necessary during detail piping design and/or piping installation.

E. Valves. Isolation valves provided with equipment and instruments shall be located in a manner which will allow ease of access and removal of the items to be isolated. Prior to soldering or brazing valves, teflon and elastomer seats and seals shall be removed to prevent damage.

3.04 PIPING ASSEMBLY

A. General

1. Contractor shall only use labor that has been qualified by training and experience to capably perform the specified activities required to accomplish the work in a satisfactory manner

2. If there is a conflict between the mechanical drawings and piping and instrumentation drawings (P&IDs), the P&ID shall take precedence. Any deviations from the Specifications or piping locations shown on the drawings require prior review and approval by Resident Engineer.

B. Buttwelded Piping

1. The specification and qualification of weld joints and welders for buttwelded piping shall be in accordance with ASME Boiler Pressure Vessel Code, Section IX, Welding and Brazing. Weld procedure specifications (WPS) and procedure qualification reports (PQR) shall be submitted to Resident Engineer for review and validation of joint design, efficiencies and strength before installation begins.

2. Nondestructive examination (NDE) shall be in accordance with the ASME Boiler and Pressure Vessel Code, Section V, Nondestructive Examination. The minimum level of NDE shall be as follows:

   a) 100 percent visual examination of welds by a qualified examiner (per ASME B31.1).

   b) Radiographic testing (RT) of 5 percent random sampling of welds.

3. If the Contractor wants to use alternative techniques or intends to apply alternative methods considered equivalent to those indicated herein, a proposal on such techniques or methods shall be submitted in writing to Resident Engineer for review and approval at least 14 days before intended date of use.

4. Welding shall not begin until weld joint and welder qualification submittals have been reviewed and approved. NDE shall be performed before the pressure and leakage testing of the piping. Weld acceptance standards shall be in accordance with ASME B31.1, Chapter VI. If a weld fails the NDE, it shall be repaired and the test repeated at no additional cost to the City.

3.05 PRESSURE AND LEAKAGE TESTING

A. All specified tests shall be made by and at the expense of Contractor in the presence, and to the satisfaction of Resident Engineer. Each piping system shall be tested for at least 1 hour with no loss of pressure. Piping shall be tested at the indicated pressures:

Service	Test Pressure	Test Medium
Water supply	1.25 times working pressure but not less than 120 psi	Water

1. Compressed air shall not be used for testing plastic piping unless specifically recommended by the pipe manufacturer.

2. Leakage may be determined by loss-of-pressure, soap solution, chemical indicator, or other positive and accurate method acceptable to Resident Engineer. All fixtures, devices, or accessories which are to be connected to the lines and which would be damaged if subjected to the specified test pressure shall be disconnected and the ends of the branch lines plugged or capped as needed during the testing.

3. Unless otherwise required by the applicable codes, drainage and venting systems shall be water or air tested. For water testing, the drainage and venting system shall be filled with water to the level of the highest vent stack. For air testing, the system shall be charged with air to a minimum pressure of 5 psig. Openings shall be plugged as necessary for either type

of test. To be considered free of leaks, the system shall hold the water or air for 30 minutes without any drop in the water level or air pressure.

4. All necessary testing equipment and materials, including tools, appliances and devices, shall be furnished and all tests shall be made by and at the expense of Contractor and at the time directed by Resident Engineer.

5. All joints in piping shall be tight and free of leaks. All joints which are found to leak, by observation or during any specified test, shall be repaired, and the tests repeated.

3.06 CLEANING

A. The interior of all pipe, valves, and fittings shall be smooth, clean, and free of blisters, loose mill scale, sand, dirt, and other foreign matter when installed. Before being placed in service, the interior of all lines shall be thoroughly cleaned, to the satisfaction of Resident Engineer.

3.07 ACCEPTANCE

A. City reserves the right to have any section of the piping system which he suspects may be faulty cut out of the system by Contractor for inspection and testing. Should the joint prove to be sound, City will reimburse Contractor on a time-and-material basis as specified in the Contract. Should the joint prove to be faulty, the destructive test will continue joint by joint in all directions until sound joints are found. Costs for replacement of faulty work and/or materials shall be the responsibility of Contractor.

END OF SECTION

SECTION 15050
BASIC MECHANICAL BUILDING SYSTEMS MATERIALS AND METHODS

PART 1 GENERAL

1.01 SCOPE

A. This section covers general mechanical building system requirements as referenced from other sections and furnishing and installation of:

1. Mechanical equipment identification
2. Seismic restraints
3. Protective coatings

for the plumbing and heating, ventilating, and air conditioning systems.

1.02 GENERAL

A. Materials furnished and installed under this section shall be fabricated, assembled, erected, and placed in proper operating condition in full conformity with the drawings, specifications, engineering data, instructions, and recommendations of the manufacturer unless exceptions are noted by the Resident Engineer.

1. Coordination. Where two or more units of the same class of materials are required, they shall be the product of a single manufacturer; however, all the component parts of the system need not be the products of one manufacturer.
2. General Equipment Stipulations. The General Equipment Stipulations shall apply to all materials furnished under this section. If requirements in this specification differ from those in the General Equipment Stipulations, the requirements specified herein shall take precedence.
3. Governing Standards. Except as modified or supplemented herein, all work covered by this section shall be performed in accordance with all applicable local codes and ordinances, laws, and regulations which pertain to such work. In case of a conflict between these specifications and any state law or local ordinance, the latter shall govern.
4. Metal Thickness. Metal thickness and gages specified herein are minimum requirements. Gages refer to US Standard gage.

1.03 SUBMITTALS

A. Drawings and Data. Complete information, detailed specifications, and data covering materials, parts, devices, and accessories forming a part of the materials furnished, shall be submitted in accordance with Specification Section 01300, "Submittals".

1. Number Plates

   a) Product data on number plates.

   b) A listing of equipment to receive number plates shall be submitted.

2. Protective Coatings

   a) Name of manufacturer.

   b) Coating type.

   c) Color.

   d) Chemical resistance data.

   e) Temperature range data.

   f) Surface preparation.

   g) Application data.

   h) Film thickness per coat.

   i) Drying and curing time information.

3. Equipment Motors

   a) Name of Manufacturer.

   b) Type and Model.

   c) Horsepower (kW) rating and service factor.

   d) Temperature rise and insulation rating.

   e) Full load rotative speed.

   f) Type of bearings and method of lubrication.

   g) Net weight.

   h) Overall dimensions.

   i) Efficiency at full, 3/4, and 1/2 loads.

   j) Full load current and power factor.

   k) Locked rotor current.

1.04 QUALITY ASSURANCE

A. Welding Qualifications. All welding procedures and welding operators shall be qualified by an independent testing laboratory in accordance with the applicable provisions of AWS Standard Qualification Procedures. All procedure and operator qualifications shall be in written form and subject to Engineer's review. Accurate records of operator and procedure qualifications shall be maintained by Contractor and made available to Resident Engineer upon request.

B. Manufacturer's Experience. Unless the equipment manufacturer is specifically named in this section, the manufacturer shall have furnished equipment of the type and size specified which has been in successful operation for not less than the past 5 years.

PART 2 MATERIALS

2.01 SERVICE CONDITIONS

A. All equipment shall be designed and selected to meet the specified conditions. Where equipment is provided with protective coatings, unit capacities shall be corrected to account for any efficiency losses from the selected protective coating.

2.02 PERFORMANCE AND DESIGN REQUIREMENTS.

A. Dimensional Restrictions. Layout dimensions will vary between manufacturers and the layout area indicated on the drawings is based on typical values of the first manufacturer listed. Contractor shall review the contract drawings, the manufacturer's layout drawings, and installation requirements and shall make any modifications required for proper installation subject to acceptance by Resident Engineer.

B. Elevation. Equipment shall be designed to operate at the elevation as indicated on the drawings.

C. Drive Units. Drive units shall be designed for 24 hour continuous service.

1. V-Belt Drives. Each V-belt drive shall include a sliding base or other suitable tension adjustment. V-belt drives shall have a service factor of at least 1.5 at maximum speed based on the nameplate horsepower [kW] of the drive motor unless otherwise indicated in the specific equipment paragraph.

2. Electric Motors. Motor horsepowers scheduled on the drawings are minimum motor horsepowers. Larger motors shall be provided if required to meet the specified capacities for the equipment furnished. Motors furnished with equipment shall meet the following requirements.

a) All motors shall meet the minimum efficiency standards required by the Energy Policy Act (EPACT) of 1992.

b) Designed and applied in accordance with NEMA, ANSI, IEEE, AFBMA, and NEC for the duty service imposed by the driven equipment, such as frequent starting, intermittent overload, high inertia, mounting configuration, or service environment.

c) Rated for continuous duty at 40°C ambient.

d) Motors used in applications which exceed the usual service conditions as defined by NEMA, such as higher than 40°C ambient, altitude exceeding 3,300 feet, explosive or corrosive environments, departure from rated voltage and frequency, poor ventilation, frequent starting, or adjustable frequency drive applications, shall be properly selected with respect to their service conditions and shall not exceed specified temperature rise limits in accordance with ANSI/NEMA MG 1 for insulation class, service factor, and motor enclosure type.

e) To ensure long life, motors shall have nameplate horsepower [kW] equal or greater than the maximum load imposed by the driven equipment and shall carry a service factor rating as follows:

Motor Size	Enclosure	Service Factor
Fractional hp	Open	1.15
	Other Than Open	1.0
Integral hp	Open	1.15
	Other Than Open	1.0

Motors used with adjustable frequency drives shall have a 1.15 service factor on sine wave power and a 1.0 service factor on drive power.

f) Designed for full voltage starting.

g) Designed to operate from an electrical system that may have a maximum of 5 percent voltage distortion according to IEEE 519.

h) Totally enclosed motors shall have a continuous moisture drain that also excludes insects.

i) Bearings shall be either oil or grease lubricated.

j) Motor nameplates shall indicate as a minimum the manufacturer name and model number, motor horsepower, voltage, phase, frequency, speed, full load current, locked rotor current, frame size, service factor, power factor, and efficiency.

k) Dripproof motors, or totally enclosed motors at Contractor's option, shall be furnished on equipment in indoor, above-grade, clean, and dry locations.

l) Totally enclosed motors shall be furnished on:

i) Outdoor equipment.

ii) Equipment for installation below grade.

iii) Equipment operating in chemical feed and chemical handling locations.

iv) Equipment operating in wet or dust-laden locations.

m) Explosion-proof motors shall be furnished as specified by applicable codes or as specified in other sections.

n) A manufacturer's standard motor may be supplied on packaged equipment and fans in which case a redesign of the unit would be required to furnish motors of other than the manufacturer's standard design. However, in all cases, the motor types indicated are preferred and shall be furnished if offered by the manufacturer as a standard option.

o) Motors used with adjustable frequency drives shall have insulation system meeting the requirements of NEMA MG 1, Part 31.

2.03 MANUFACTURE AND FABRICATION

A. Welding. All welds shall be continuous (seal type) on submerged or partially submerged components.

B. Anchor Bolts and Expansion Anchors. Anchor bolts, expansion anchors, nuts, and washers shall be as indicated in Specification Section 05550, "Anchorage in Concrete and Masonry" unless otherwise indicated on the drawings.

C. Edge Grinding. Sharp corners of cut or sheared edges which will be submerged in operation shall be dulled by at least one pass of a power grinder to improve paint adherence.

D. Surface Preparation. All iron and steel surfaces, except motors, shall be shop cleaned by sandblasting or equivalent, in strict conformance with the paint manufacturer's recommendations. All mill scale, rust, and contaminants shall be removed before shop primer is applied.

2.04 IDENTIFICATION OF MATERIALS

A. Mechanical Identification. Mechanical equipment shall be identified with engraved or stamped equipment plates securely affixed to the equipment in an accessible and visible location. Equipment plates shall be in addition to the number plates specified in the following paragraph. Equipment plates shall indicate the manufacturer's name, address, product name, catalog number, serial number, capacity, operating and power characteristics, labels of tested compliances, and any other pertinent design data. Equipment plates listing the distributing agent only will not be acceptable.

1. Number Plates. All equipment and control equipment denoted on the drawings by a symbol and an identifying number shall be provided with an identifying number plate. The identifying text shall be identical to the symbols indicated herein or on the drawings and shall be located in a conspicuous place. Number plate symbols and numbers shall be capitalized block letters with a minimum height as indicated below.

Item Identified	Letter Height, inches
Major Equipment	3/4
Minor Equipment	1/2
Control Panels	3/16

Number plate height shall be twice the letter height. Number plate length shall be as needed, with suitable margins all around. Lettering shall be placed in one row where practicable; however, where necessary due to excessive length, lettering shall be placed on more than one row and centered.

Number plates shall be in the form of nameplates unless equipment is too small to accommodate the specified nameplate, then tags shall be used. Nameplates and tags shall be metal or plastic. Plastic nameplates and tags shall be laminated phenolic not less than 1/8 inch thick and shall be black with a white core. Metal nameplates and tags shall be at least 12 gage thickness with engraved or imprinted symbols. Tags shall have smooth edges and shall be a minimum diameter of 1-1/2 inches. Hand-lettered or tape labels will not be acceptable. Tags shall be installed with corrosion-resistant chains or straps. Nameplates shall be installed with corrosion-resistant mechanical fasteners.

Number plates for control equipment such as but not limited to thermostats, control stations, and emergency ventilation shutoff switches shall in addition to the specific device identification list the controlled equipment in parenthesis below the device number.

2. Piping. Piping identification shall be as specified in Specification Section 09900, "Painting and Coating". The lettering size, length of color field, colors, and viewing angles of identification devices shall be in accordance with ASME A13.1.

3. Valves. Valves that have been assigned an identification number shall be identified with tags. Valve tags shall comply with the requirements listed in the Number Plates paragraph.

4. Ductwork. Ductwork shall be identified with nameplates as specified herein, or stenciled painting as specified in Specification Section 09900, "Painting and Coating". Ductwork shall be identified with the equipment number and area served, direction of airflow, and service (supply, return, mixed, exhaust, and outside air). The identification shall be located at equipment, at each side of structure or enclosure penetrations, and at each obstruction.

B. Seismic Restraints. All ductwork and piping associated with the plumbing and HVAC systems shall be provided with seismic restraints in accordance with Seismic Hazard Level (SHL) of the latest edition of the SMACNA Seismic Restraint Manual Guidelines for Mechanical Systems as specified and in accordance with the applicable building code. The seismic hazard level used to design the restraints shall be level A. Water heaters shall be restrained in accordance with applicable plumbing code.

C. Protective Coatings. Where indicated on the drawings, sheet metal ductwork, dampers, registers, grilles, and equipment shall be given a protective coating suitable for the corrosive atmosphere indicated. Sheet metal ductwork, dampers, registers, grilles, and equipment construction shall be suitable to allow proper application of the protective coating system in accordance with the manufacturer's recommendation.

PART 3 EXECUTION

3.01 INSTALLATION

A. Materials furnished under this section shall be installed in proper operating condition in full conformity with the drawings, specifications, engineering data, instructions, and recommendations of the manufacturer, unless exceptions are noted by the Resident Engineer.

B. The installation of identifying devices shall be coordinated with the application of covering materials and painting where devices are applied to surfaces. All surfaces to receive adhesive number plates shall be cleaned before installation of the identification device.

END OF SECTION

SECTION 15060
MISCELLANEOUS PIPING AND PIPE ACCESSORIES

PART 1 GENERAL

1.01 SCOPE

A. This section covers the furnishing of miscellaneous piping and pipe accessories. Miscellaneous piping shall be furnished complete with all fittings, flanges, unions, and other accessories specified herein.

1.02 SUBMITTALS

A. Drawings and Data. Complete specifications, data and catalog cuts or drawings shall be submitted in accordance with Specification Section 01300, "Submittals". Submittals are required for all piping, fittings, gaskets, sleeves, and accessories, and shall include the following data:

1. Name of Manufacturer
2. Type and model
3. Construction materials, thickness, and finishes
4. Pressure and temperature ratings

Contractor shall obtain and submit a written statement from the gasket material manufacturer certifying that the gasket materials are compatible with the joints specified herein and are recommended for the specified field test pressures and service conditions.

1.03 DELIVERY, STORAGE, AND HANDLING.

A. Shipping shall be in accordance with Specification Section 01612, "Shipping". Handling and storage shall be in accordance with Specification Section 01614,"Handling and Storage". All materials shall be stored in a sheltered location above the ground, separated by type, and shall be supported to prevent sagging or bending.

PART 2 MATERIALS

2.01 PIPING

A. Miscellaneous piping materials shall be as specified herein.

1. Material Classification BR-1.

BR-1 – Regular Weight Brass Pipe Gauge piping for cold water.	Pipe Fittings	ASTM B43, red brass, seamless, regular weight. ANSI/ASME B16.15, Class 125.

2. Accessories. Accessories for the miscellaneous piping systems shall be as indicated.

a) Unions for brass pipe: Fed Spec A-A-59617, Class 125

PART 3 EXECUTION

3.01 INSTALLATION

A. Materials furnished under this section will be installed in accordance with Specification Section 15020, "Miscellaneous Piping and Accessories Installation".

END OF SECTION

SECTION 15063
PIPE HANGERS AND SUPPORTS

PART 1 GENERAL

1.01 DESCRIPTION

A. This section includes materials and installation of pipe hangers and supports including accessory items, such as anchor bolts and screws and neoprene isolation pads.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 09961 - Fusion-Bonded Epoxy Linings and Coatings

B. Section 15060 - Miscellaneous Piping and Pipe Accessories

1.03 SUBMITTALS

A. Submit shop drawings in accordance with the General Conditions and Specification Section 01300, "Submittals".

B. Provide line drawings of each piping system to the scale shown in the drawings, locating each support or hanger. Identify each type of hanger or support by the manufacturer's catalog number or figure.

C. Provide installation drawings and manufacturer's catalog information on each type of hanger and support used. Clearly indicate the actual pipe outside diameter (not just nominal pipe size) that is used for the hangers and supports.

PART 2 MATERIALS

2.01 DESIGN CRITERIA

A. Not all pipe supports or hangers required are shown in the drawings. Provide pipe supports for every piping system installed. Support piping by pipe support where it connects to pumps or other mechanical equipment.

B. Pipe support and hanger components shall withstand the dead loads imposed by the weight of the pipes, fittings, and valves (all filled with water), plus valve actuators and any insulation, and shall have a minimum safety factor of five based on material ultimate strength.

2.02 HANGER AND SUPPORT SYSTEMS

A. Pipe hangers and supports shall be as manufactured by Anvil, Unistrut, B-Line, Superstrut, or equal.

B. Pipe hangers and supports shall comply with MSS SP-58 for the standard types referenced in the drawings. Construct special hangers and supports if detailed in

the drawings. Type numbers for standard hangers and supports shall be in accordance with MSS SP-58 as listed below:

Type Number	Description	Manufacturer and Model (or Equal)
3	Steel double-bolt pipe clamp	Anvil Fig. 295A or 295H, B-Line B3144 or B3144A
4	Steel pipe clamp (pipes smaller than 3 inches)	Anvil Fig. 212, B-Line B3140
	Steel pipe clamp (pipes 3 inches and larger)	Anvil Fig. 216, B-Line B3142
24	U-bolt	Anvil Fig. 137, B-Line B3188
37	Pipe stanchion saddle	Anvil Fig. 259, B-Line B3090
38	Adjustable pipe saddle support	Anvil Fig. 264, B-Line B3089

C. Pipe hangers and supports shall be hot-dipped galvanized per ASTM A153 carbon steel (ASTM A36, A575, or A576). Bases, rollers, and anchors shall be steel as described above or may be cast iron (ASTM A48). Pipe clamps shall be steel as described above or may be malleable iron (ASTM A47). Pipe clamps located in the drain vault shall be Type 316 stainless steel.

2.03 OFFSET PIPE CLAMP

A. Anvil Figure 103 or equal. Material shall be Type 316 stainless steel.

2.04 STEEL CHANNEL FRAMING SYSTEM

A. Steel channel frames shall be 1 5/8 inches wide by 1 5/8 or 3 1/4 inches high by 12-gauge metal thickness, unless otherwise shown in the drawings. Material shall conform to ASTM A36, A570 (Grade 33 minimum), or A653 unless stainless steel is indicated in the drawings. Stainless steel shall be Type 304. One side of the channel shall have a continuous open slot with inturned clamping ridges. Maximum allowable stress under any combination of applied uniformly distributed loads and concentrated loads shall not exceed those recommended in the AISC or AISI. Deflection shall not exceed 1/240 of span. Use multiple back-to-back channels to achieve these criteria if single channels are not sufficient. Products: Unistrut P1000 or P5000 Series, B-Line B11 or B22 Series, or equal.

B. Steel channels shall be hot-dipped galvanized per ASTM A153.

C. Nuts shall be machined and case hardened. Provide rectangular nuts with the ends shaped to permit a quarter turn crosswise in the framing channel. Provide two serrated grooves in the nut to engage the inturned edges of the channel.

D. Pipe clamps (including attachment screws and nuts) shall be Unistrut P1100 or P2000 Series, B-Line B2000 Series, or equal. Material shall be Type 304 stainless steel.

2.05 NEOPRENE ISOLATING SLEEVES FOR METAL PIPE 6 INCHES AND SMALLER

A. Unistrut P2600, B-Line "Vibrocushion," or equal.

2.06 ANCHOR BOLTS AND SCREWS

A. Anchor bolts and screws for attaching pipe supports and hangers to walls, floors, ceilings, and roof beams shall be hot-dipped galvanized steel, ASTM A307. Nuts shall be galvanized steel, ASTM A563.

PART 3 EXECUTION

3.01 PIPE HANGER AND WALL SUPPORT SPACING

Install pipe hangers and wall supports on horizontal and vertical runs at the spacing shown or detailed in the drawings. Provide hanger rods (for horizontal runs) and wall supports of the sizes shown or detailed in the drawings. If no spacing or rod sizes are given in the drawings or in the specifications for a particular piping system, use the following:

A. Pipe Hanger or Wall Support Spacing for Pipe

Pipe Size (inches)	Maximum Support or Hanger Spacing (feet)	Minimum Rod Size (feet)
1 and smaller	4	3/8
1 1/4 through 2	6	3/8
2 1/2 through 3	8	1/2

3.02 INSTALLING PIPE HANGERS AND SUPPORTS

A. Provide separate hangers or supports at each valve. Provide one hanger or support around each end of the valve body or on the adjacent connecting pipe within one pipe diameter of the valve end. Provide additional hangers or supports to relieve eccentric loadings imposed by offset valve actuators.

B. Provide separate hangers or supports at each pipe elbow, tee, or fitting. Provide separate hangers or supports on both sides of each nonrigid joint or flexible pipe coupling.

C. Adjust pipe hangers per MSS SP-89, paragraph 10.6.

D. Install leveling bolts beneath support baseplates. Provide 1-inch thick grout pad beneath each base.

E. Install piping without springing, forcing, or stressing the pipe or any connecting valves, pumps, and other equipment to which the pipe is connected.

3.03 INSTALLING STEEL CHANNEL FRAMES

A. Use 1-5/8-inch-high channel frames unless 3-1/4-inch is needed to provide clearance from walls. Use multiple back-to-back channels if additional clearance is needed.

3.04 INSTALLING NEOPRENE ISOLATING SLEEVES

A. Install a sleeve around each metal pipe 6 inches and smaller at the point of bearing or contact with the pipe hanger or support.

END OF SECTION

SECTION 15067
MISCELLANEOUS PLASTIC PIPE, TUBING, AND ACCESSORIES

PART 1 GENERAL

1.01 SCOPE

A. This section covers the furnishing of miscellaneous plastic pipe, tubing, and accessories. Pipe and tubing shall be furnished complete with all fittings, flanges, unions, jointing materials and other necessary appurtenances.

1.02 SUBMITTALS

A. Drawings and Data. Complete specifications, data and catalog cuts or drawings shall be submitted in accordance with the submittals section. Submittals are required for all piping, fittings, gaskets, sleeves, and accessories, and shall include the following data:

1. Name of Manufacturer
2. Type and model
3. Construction materials, thickness, and finishes
4. Pressure and temperature ratings

B. Contractor shall obtain and submit a written statement from the gasket material manufacturer certifying that the gasket materials are compatible with the joints specified herein and are recommended for the specified field test pressures and service conditions.

1.03 DELIVERY, STORAGE, AND HANDLING

A. Shipping shall be in accordance with Specification Section 01612, "Shipping". Handling and storage shall be in accordance with Specification Section 01614,"Handling and Storage". All materials shall be stored in a sheltered location above the ground, separated by type, and shall be supported to prevent sagging or bending.

B. Pipe, tubing, and fittings shall be stored between 40°F and 90°F.

PART 2 MATERIALS

2.01 PVC PIPE MATERIALS

A. PVC pipe materials and services shall be as specified herein.

1. Material Classification PVC-1

PVC-1 – Schedule 40 PVC Pipe with Solvent Welded Joints. Floor, Vault and Sump Drains.	Pipe Fittings	ASTM D1785, Cell Classification 12454, bearing NSF seal, Schedule 40. ASTM D2466, Cell Classification 12454, bearing NSF seal.

2. Material Classification PVC-2

PVC-2 – Schedule 80 PVC Pipe. Sleeves for copper tubing. Combination air valve and pipe drain piping.	Pipe	ASTM D1785, Cell Classification 12454, bearing NSF seal,

3. Material Classification PVC-3

PVC-3 – PVC Drain, Waste Vent (DWV) Pipe (Single Wall) with Solvent Welded Joints. Drainage piping for plumbing systems.	Pipe Fittings	ASTM D1785, cell classification 12454, bearing NSF seal. ASTM D2665 and ASTM D3311, cell classification 12454, bearing NSF seal.

4. Accessory Materials. Accessory materials for the PVC Pipe systems shall be as indicated.

Flanges	Diameter and drilling shall conform to ANSI/ASME B16.5, Class 150. Schedule 80 for DWV systems.
Flange Bolts and Nuts	ASTM A307, Grade B, length such that, after installation, the bolts will project 1/8 to 3/8 inch beyond outer face of the nut. Stainless steel for DWV and chemical feed systems, galvanized steel for all other systems.
Flat Washers	ANSI B18.22.1, plain. Same material as bolts and nuts.
Flange Gaskets	Full face, 1/8 inch thick, chemical-resistant elastomeric material suitable for the specified service.
Expansion Joints	Edlon "Thermo-molded TFE" or Resistoflex "Style R6905" molded expansion joint.

PART 3 EXECUTION

3.01 INSTALLATION

A. Materials furnished under this section will be installed in accordance with Specification Section 15020, "Miscellaneous Piping and Accessories Installation".

END OF SECTION

SECTION 15068
MISCELLANEOUS STEEL PIPE, TUBING, AND ACCESSORIES

PART 1 GENERAL

1.01 SCOPE

A. This section covers the furnishing of miscellaneous steel pipe, tubing and accessories that for pipe diameters 4 inches and smaller. Pipe and tubing shall be furnished complete with all fittings, flanges, unions, and other accessories specified herein.

B. Steel pipe for potable water conveyance is covered in the Whitebook.

1.02 GENERAL

A. General Equipment Stipulations. The General Equipment Stipulations shall apply to all equipment furnished under this section. If requirements in this specification differ from those in the General Equipment Stipulations, the requirements specified herein shall take precedence.

1.03 SUBMITTALS

A. Drawings and Data. Complete specifications, data, and catalog cuts or drawings shall be submitted in accordance with the Submittals section. Submittals are required for all piping, fittings, gaskets, sleeves, and accessories, and shall include the following data:

1. Name of Manufacturer
2. Type and model
3. Construction materials, thickness, and finishes
4. Pressure and temperature ratings

B. Contractor shall obtain and submit a written statement from the gasket material manufacturer certifying that the gasket materials are compatible with the joints specified herein and are recommended for the specified field test pressures and service conditions.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Shipping shall be in accordance with Specification Section 01612, "Shipping". Handling and storage shall be in accordance with Specification Section 01614,"Handling and Storage". All materials shall be stored in a sheltered location above the ground, separated by type, and shall be supported to prevent sagging or bending.

1. Coated Pipe. Handling methods and equipment used shall prevent damage to the protective coating and shall include the use of end hooks, padded calipers, and nylon or similar fabric slings with spreader bars. Bare cables, chains, or metal bars shall not be used. Coated pipe shall be stored off the ground on wide, padded skids. Plastic coated pipe shall be covered or otherwise protected from exposure to sunlight.

PART 2 MATERIALS

2.01 GALVANIZED STEEL PIPE

A. Galvanized steel pipe materials and service shall be specified herein.

1. Material Classification CSG-1.

CSG-1 – Standard Weight Galvanized Steel with Threaded Fittings All pipe sleeves except where plastic sleeves are required.	Pipe Fittings	ASTM A53, Type E, standard weight, Grade A or B; or ASTM A106, of equivalent thickness, galvanized. Cast iron threaded, galvanized. Fittings shall conform to ANSI/ASME B16.4, Class 125.

2. Material Classification CSG-2.

CSG-2 – Standard Weight Galvanized Steel with Threaded Fittings Drain piping from equipment.	Pipe Fittings	ASTM A53, Type E, standard weight, Grade A or B; or ASTM A106, of equivalent thickness, galvanized. Malleable iron threaded, galvanized. Fittings shall conform to ANSI/ASME B16.3, Class 150, or Fed Spec WW-P-521, Type II.

PART 3 EXECUTION

3.01 INSTALLATION

A. Materials furnished under this section will be installed in accordance with Specification Section 15020, "Miscellaneous Piping and Accessories Installation".

END OF SECTION

SECTION 15070
COPPER TUBING AND ACCESSORIES

PART 1 GENERAL

1.01 SCOPE

A. This section covers the furnishing of copper tubing and accessories. Copper tubing shall be furnished complete with all fittings, flanges, unions, and other accessories specified herein.

1.02 SUBMITTALS

A. Drawings and Data. Complete specifications, data, and catalog cuts or drawings shall be submitted in accordance with the Submittals section. Submittals are required for all piping, fittings, gaskets, sleeves, and accessories, and shall include the following data:

1. Name of Manufacturer
2. Type and model
3. Construction materials, thickness, and finishes
4. Pressure and temperature ratings

B. Contractor shall obtain and submit a written statement from the gasket material manufacturer certifying that the gasket materials are compatible with the joints specified herein and are recommended for the specified field test pressures and service conditions.

1.03 DELIVERY, STORAGE, AND HANDLING

A. Shipping shall be in accordance with Specification Section 01612, "Shipping". Handling and storage shall be in accordance with Specification Section 01614,"Handling and Storage". All materials shall be stored in a sheltered location above the ground, separated by type, and shall be supported to prevent sagging or bending.

PART 2 MATERIALS

2.01 PIPING

A. Copper tubing materials and service shall be as specified herein.

1. Material Classification CU-1.

CU-1 – Water Tubing with Solder and Brazed Joints Potable water supply, 3 inch and smaller.	Tubing Fittings Flanges	Hard drawn copper tubing, ASTM B88, Type L. Solder joint (smaller than 2 inch), Brazed joint (2 inch and larger), material to match tubing. Fittings shall conform to ANSI B16.18, or ANSI/ASME B16.22. Where required for connection to equipment, valves, and accessories, ANSI B16.24, class 150, cast bronze, brazed joint.

2. Material Classification CU-2.

CU-2 – Buried or submerged piping.	Tubing Fittings	Soft annealed copper tubing, ASTM B88, Type K. Solder joint (smaller than 2 inch), Brazed joint (any size), material to match tubing. Fittings shall conform to ANSI B16.18, or ANSI/ASME B16.22.

3. Accessory Materials. Accessory materials for the copper tubing systems shall be as indicated.

Flange Bolts and Nuts	ASTM A307, Grade B, length such that, after installation, the bolts will project 1/8 to 3/8 inch beyond outer face of the nut.
Flange Gaskets	ASTM D1330, Grade I, red rubber, ring type, 1/8 inch thick.
Expansion Joints	Tempflex "Model HB Expansion Compensators" with copper tube ends.
Insulating Fittings	
Threaded	Dielectric steel pipe nipple, ASTM A53, Schedule 40, poly-propylene lined, zinc plated; Perfection Corp. "Clearflow Fittings".
Flanged	Epco "Dielectric Flange Unions" or Central Plastics "Insulating Flange Unions".

PART 3 EXECUTION

3.01 INSTALLATION

A. Materials furnished under this section will be installed in accordance with the Specification Section 15020, "Miscellaneous Piping and Accessories Installation".

END OF SECTION

SECTION 15091
MISCELLANEOUS BALL VALVES

PART 1 GENERAL

1.01 SCOPE

A. This section covers the furnishing of manually operated ball valves as specified herein.

B. Miscellaneous ball valves shall be provided where AWWA type ball valves are not required.

C. Piping, pipe supports, insulation, and accessories that are not an integral part of the valves or are not specified herein are covered in other sections.

1.02 SUBMITTALS

A. Complete drawings, details, and specifications covering the valves and their appurtenances shall be submitted in accordance with Specification Section 01300, "Submittals". Included in the submittal shall be drawings by the valve manufacturer to indicate the position of the valve actuator and valve shaft.

1.03 DELIVERY, STORAGE, AND HANDLING

A. Shipping shall be in accordance with Specification Section 01612, "Shipping". Handling and storage shall be in accordance with Specification Section 01614,"Handling and Storage".

PART 2 MATERIALS

2.01 CONSTRUCTION

A. Ball valves shown on the drawing, but not specified herein, shall be selected to match piping material they are installed in.

1. Valves Type VB-1 – Ball valves indicated on the plumbing drawings for water service for metallic piping systems.

Rating	500 psi nonshock cold WOG
Code	MSS SP-110, NSF Certified
Type	In-line, three piece, end entry, full port
Body/Bonnet	ASTM B584–C84400 bronze
Trim	
Seat	Reinforced Teflon
Ball	Brass, or chrome plated brass
Stem	Brass or bronze
Thrust Washer	Reinforced Teflon
Stem Seal	Teflon or Viton
End Connection	Threaded End
Temp. Limitations	-20 to 400°F

Valve Operator	Lever
Manufacturers	Conbraco Industries "Apollo 82-100 Series"

2. Length Tolerance. Unless otherwise specified, the actual length of valves shall be within plus or minus 1/16 inch of the specified or theoretical length.

3. Shop Coatings. All ferrous metal surfaces of valves and accessories, both interior and exterior, shall be shop coated for corrosion protection. The valve manufacturer's standard coating will be acceptable, provided it is functionally equivalent to the specified coating and conforms to NSF certification, where applicable.

Coating Materials	
Epoxy Enamel (for liquid service)	Ameron "Amerlock 400 High-Solids Epoxy Coating", Carboline "Carboguard 891", or Tnemec "Series N140 Pota-Pox Plus".
Rust-Preventive Compound	As recommended by the manufacturer.

Surfaces To Be Coated	
Unfinished Surfaces	
Interior Surfaces	
Liquid Service	Epoxy enamel.
Exterior Surfaces of Valves To Be Buried, Submerged, or Installed in Manholes or Valve Vaults	Asphalt varnish or coal tar epoxy.
Exterior Surfaces of all other valves	Universal primer.

2.02 VALVE ACTUATORS

A. Ball valves shall be equipped with a soft rubber coated lever operator.

PART 3 EXECUTION

3.01 INSTALLATION

A. Materials furnished under this section shall be installed in accordance with Specification Section 15010, "Valve Installation".

END OF SECTION

SECTION 15110
GLOBE PATTERN CONTROL VALVES (AWWA C530)

PART 1 GENERAL

1.01 DESCRIPTION

A. This section includes materials and installation of globe pattern diaphragm-actuated control valves for various functions on the project.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 01650 - Startup Requirements

B. Section 01730 – Operations and Maintenance Data

C. Section 09900 - Painting and Coating

D. Section 09961 - Fusion-Bonded Epoxy Linings and Coatings

E. Section 15010 - Valve Installation

1.03 SUBMITTALS

A. Submit shop drawings in accordance with the General Conditions and Specification Section 01300, "Submittals".

B. Submit dimensional drawings for each size and type of valve provided.

C. Provide listing of materials of construction, with ASTM reference and grade. Show valve lining and paint primer coating with coating manufacturer and coating system number or designation.

D. Submit electrical drawings, showing wire and terminal connections, for valves that are electrically controlled.

E. Submit manufacturer's recommended maximum operating pressure and maximum recommended flow.

F. Submit operations and maintenance data for each valve in accordance with Specification Section 01730, "Operation and Maintenance Data".

1.04 MANUFACTURERS' SERVICES

A. Provide equipment manufacturers' services at the jobsite for the minimum labor days listed below, travel time excluded:

One labor day to check the installation and advise during start-up, testing, and adjustment of each valve installation and instruct the Owner's personnel in the operation and maintenance of the valves.

PART 2 MATERIALS

2.01 MANUFACTURERS

A. Diaphragm-actuated control valves shall be manufactured by Cla-Val Company, Newport Beach, California or City approved equal. All control valves under this section shall be provided by one manufacturer.

2.02 PCVALVE DESIGN--DIAPHRAGM ACTUATED

A. Valves shall be hydraulically actuated diaphragm type complying with AWWA C530 except as modified herein.

B. All major components of the pilot control system shall be manufactured by the same company that manufactures the main valve.

C. Valves shall have internal and external epoxy coating in accordance with Specification Section 09961, "Fusion-Bonded Epoxy Linings and Coatings". Internal coating material shall be NSF certified for potable water

2.03 MATERIALS OF CONSTRUCTION--DIAPHRAGM-ACTUATED VALVES

A. Materials of construction for valves shall be as follows:

Item	Material
Main valve body and cover	Ductile iron, ASTM A536, Grade 65-45-12
Main valve trim, seat, disc guide, and cover bearings	Type 316 stainless steel, ASTM A276, A 351, or A 743
Diaphragm washer and disc retainer	Type 303 stainless steel
Pilot control system	Bronze per paragraph B below with Type 303 stainless steel trim
Piping and tubing	Type 316 Stainless steel
Stem	Type 303 stainless steel
Elastomers	Buna-N
Cover screws, caps, and nuts and bolts	Type 316 stainless steel

B. Bronze in contact with water shall have the following chemical characteristics:

Constituent	Content
Zinc	7% maximum
Aluminum	2% maximum
Lead	8% maximum
Copper + Nickel + Silicon	83% minimum

2.04 VALVE END CONNECTIONS

A. Valves shall have flanged ends rated to match the pressure class indicated.

B. Flanges for ductile-iron valves shall be ductile iron, same grade and pressure rating as the valve. Flanges shall be flat face for class 150 valves.

2.05 LIMIT SWITCHES

A. Limit switches shall be single pole, double throw in a NEMA 4 enclosure. Voltage shall be 120 volts, 60 hertz, a-c.

2.06 VALVES

A. Pressure-Relief Valves:

1. The valve shall maintain a maximum upstream pressure by opening to relieve high pressure. Pilot control system shall operate such that as excess line pressure is dissipated, the valve shall slowly close. The pressure-relief pilot control shall be adjustable over a range of 20 to 105 psi. Provide strainer, three isolation valves in the pilot control piping and tubing.

   Valve shall be similar to Cla-Val model:
   - 8" 50G-01BPKCX D/T 150LB Flanged Pressure Relief Valve
   - KX= 303 SST Diaphragm Washer/Disc Retainer
   - KX= 316 SST Tubes/Fittings
   - KX= 316 SST Cover Bolts/Plugs
   - X105LCW Micro Switch Installed

B. Pump Control Valves:

1. The valve shall be closed when the pump starts. After the pump starts, a solenoid control valve on the pump control valve pilot shall energize and the main valve shall slowly open. When the pump is signaled to shut off, the solenoid control valve shall de-energize and the main valve shall slowly close. When the main valve is completely closed, a limit switch assembly shall shut off the pump. Provide a built-in lift-type check valve to close should flow reverse, or provide an emergency quick-close solenoid installed in the control piping to close the main valve quickly in the event of a power failure, regardless of the solenoid, diaphragm, or piston position. The valve shall have field adjustable rate of valve opening and closing.

2. Control of valve operation shall be by means of an externally mounted, four-way, solenoid pilot valve. Provide self-cleaning strainers or wye strainers to protect the control system. Provide a limit switch, adjustable over the entire valve travel. Limit switch shall be single pole, double throw in a NEMA 4 enclosure. Solenoid valve shall have a NEMA 4 enclosure. Voltage shall be 120-volt a-c, 60 hertz.

3. Valve shall be similar to Cla-Val model:

   - 12" 60G-50BPYKCX D/T 150LB Flanged Booster Pump Control Valve

- KX= 303 SST Diaphragm Washers/Disc Retainer
- KX= 316 SST Tubes/Fittings
- KX= 316 SST Cover Bolts/Plugs
- CSM-11 4-Way Solenoid 120/60 VAC

2.07 BOLTS AND NUTS FOR FLANGED VALVES

A. Bolts and nuts for flanged valves shall be as specified for the piping to which the valves are connected.

B. Provide washers for each nut. Washers shall be of the same material as the nuts.

2.08 GASKETS FOR FLANGES

A. Gaskets for flanged end valves shall be as specified for the piping to which the valve is connected.

2.09 SPARE PARTS

A. Provide the following spare parts for each valve:

Quantity	Description
1	Diaphragm, disc, and spacer washer set (for diaphragm-actuated valves).
1	Strainer.
2	Isolation valves for each valve pilot system.
1	Solenoid control valve for each solenoid-controlled valve.
1	Limit switch for each valve having a limit switch assembly.
1	Throttling valve for opening/closing speed control.

B. Pack spare parts in a wooden box and label with parts description and vendor name, address, and telephone number.

PART 3 EXECUTION

3.01 SHIPMENT AND STORAGE

A. Ship and deliver valves in accordance with AWWA C530, Section 6 and as follows.

B. Provide flanged openings with metal closures at least 3/16-inch thick, with elastomer gaskets and at least four full-diameter bolts. Install closures at the place of valve manufacture prior to shipping. For studded openings, use all the nuts needed for the intended service to secure closures.

C. Provide threaded openings with steel caps or solid-shank steel plugs. Do not use nonmetallic (such as plastic) plugs or caps. Install caps or plugs at the place of valve manufacture prior to shipping.

D. Inspect valves on receipt for damage in shipment and conformance with quantity and description on the shipping notice and order. Unload valves carefully to the ground without dropping. Use forklifts or slings under skids. Do not lift valves with

slings or chain around valve bonnet, pilot housing, or through waterway. Lift valves with eyebolts or rods through flange holes or chain hooks at ends of valve parts.

E. Protect the valve and pilot system from weather and the accumulation of dirt, rocks, and debris. Also, see the manufacturer's specific storage instructions.

F. Make sure flange faces, joint sealing surfaces, body seats, and disc seats are clean. Check the bolting attaching the bonnet or pilot housing to the valve for loosening in transit and handling. If loose, tighten firmly.

G. If the valves and associated actuators are stored or installed outside or in areas subject to temperatures below 40°F or are exposed to the weather prior to permanent installation, provide the manufacturer's recommended procedures for extended storage. Provide temporary covers over actuator electrical components. Provide temporary conduits, wiring, and electrical supply to space heaters. Exercise each valve from its fully open to fully closed position at least once every seven days. Inspect electrical contacts before start-up.

3.02 LINING AND COATING

A. Coat exteriors of valves the same as the adjacent piping.

B. Line interiors of valves with 12 mils of fusion-bonded epoxy per Specification Section 09961, "Fusion-Bonded Epoxy Linings and Coatings".

C. Do not coat seating areas and bronze or stainless steel pieces.

3.03 VALVE SERVICE CONDITIONS

A. Valve service conditions shall be as shown below.

Valve Type	Pressure Relief	Pump Control
Valve Diameter	8"	12"
Maximum flow (gpm)	3,000	2,750
Minimum flow (gpm)	200	1,000
Maximum upstream pressure (psi)	75	27
Minimum upstream pressure (psi)	70	20
Maximum downstream pressure (psi)	27	75
Minimum downstream pressure (psi)	20	75
Pressure-relief setting (psi)	85	-

3.04 VALVE INSTALLATION

A. Remove covers over flanged openings and plugs from threaded openings, after valves have been lifted off the truck and placed at the point to which it will be connected to the adjacent piping.

B. Bolt holes of flanged valves shall straddle the horizontal and vertical centerlines of the pipe run to which the valves are attached. Clean flanges by wire brushing before installing flanged valves. Clean flange bolts and nuts by wire brushing,

lubricate threads as specified in the piping specifications, and tighten nuts uniformly and progressively. If flanges leak under pressure testing, loosen or remove the nuts and bolts, reseat or replace the gasket, reinstall or retighten the bolts and nuts, and retest the joints. Joints shall be watertight.

C. Clean threaded joints by wire brushing or swabbing. Apply Teflon® joint compound or Teflon® tape to pipe threads before installing threaded valves. Joints shall be watertight.

D. Handle valves carefully when positioning, avoiding contact or impact with other equipment or vault or building walls.

E. Clean valve interiors and adjacent piping of foreign material prior to making up valve to pipe joint connection. Prepare pipe ends and install valves in accordance with the pipe manufacturer's instructions for the joint used. Do not deflect pipe-valve joint. Do not use a valve as a jack to pull pipe into alignment. The installation procedure shall not result in bending of the valve/pipe connection with pipe loading.

F. Prior to assembly, coat threaded portions of stainless steel bolts and nuts with lubricant.

G. Provide ¼" diameter copper tube to convey drain water from the solenoid exhaust port to floor drain. Provide air gap between the solenoid exhaust tube and drain.

3.05 VALVE PRESSURE TESTING

A. Test valves at the same time that the connecting pipelines are pressure tested. Protect or isolate any parts of valves, operators, or control and instrumentation systems whose pressure rating is less than the test pressure.

END OF SECTION

SECTION 15250
MECHANICAL INSULATION

PART 1 GENERAL

1.01 SCOPE.

This section covers the furnishing and installation of insulation, jackets, and accessories for the following mechanical systems:

A. Ductwork

1. Building insulation materials are specified in other sections. Insulation for mechanical equipment which is to be applied at the factory prior to shipment is specified in the individual equipment sections.

1.02 GENERAL.

Materials furnished and installed under this section shall be in full conformity with the drawings, specifications, engineering data, instructions, and recommendations of the equipment manufacturer unless exceptions are noted by Engineer.

A. Coordination. Contractor shall be responsible for coordinating the installation of insulation with the installation of the items or systems to be insulated. Each item or system shall be tested and accepted by Engineer before installation of the insulation materials.

Contractor shall verify that each component of the insulation systems is compatible with all other parts of the system; that all insulation materials are appropriate for the intended applications; and that all necessary devices and accessories have been provided.

All insulation of the same class shall be the product of a single manufacturer; however, all the insulation types need not be the products of one manufacturer.

B. Governing Standards. Except as modified or supplemented herein, all work covered by this section shall be performed in accordance with all applicable municipal codes and ordinances, laws, and regulations. In case of a conflict between this section and any state law or local ordinance, the latter shall govern.

All work shall comply with UL, NFPA, and ASTM safety requirements.

C. Metal Thickness. Metal thickness and gages specified herein are minimum requirements. Gages refer to US Standard gage.

D. Surface Burning Characteristics. Insulation, jackets, tapes, and adhesives to be used indoors shall have a composite flame spread rating not to exceed 25 and a composite smoke developed rating of 50 when tested by UL 723, NFPA 255, or ASTM E84. All testing shall be done on materials of the same densities and installed thicknesses as the materials being installed. Insulation materials which

have been treated with a flame retardant additive to meet the required flame spread and smoke developed ratings are not acceptable.

E. Painting and Identification. Field painting and identification shall be as specified in Specification Section 09900, "Painting and Coating".

1.03 SUBMITTALS.

A. Drawings and Data. A complete list of materials and catalog cuts, together with detailed specifications, materials performance data, installation instructions, parts, devices, and accessories furnished, shall be submitted in accordance with the Submittals section. Information shall include certified test results to show compliance with UL, NFPA, and ASTM safety requirements.

1.04 QUALITY ASSURANCE.

A. Manufacturer Experience. A manufacturer shall have furnished material of the type specified which has been in successful operation for not less than the past 5 years.

1.05 DELIVERY, STORAGE, AND HANDLING.

A. Shipping shall be in accordance with Specification Section 01612, "Shipping". Handling and storage shall be in accordance with Specification Section 01614,"Handling and Storage".

PART 2 MATERIALS

2.01 DUCTING INSULATION

A. Type Duct Blanket Insulation. Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II and ASTM C 1290, Type III with factory-applied FSK (Foil Skim Kraft) jacket. Factory applied jacket requirements are specified in "Factory-Applied Jackets" Article.

B. Products: Subject to compliance with requirements, provide one of the following:

1. CertainTeed Corp.; SoftTouch Duct Wrap.
2. Johns Manville; Microlite.
3. Knauf Insulation; Friendly Feel Dcut Wrap.
4. Owens Corning; SOFTR All_Service Duct Wrap.

C. Adhesives: Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated unless otherwise indicated.

D. FSK Adhesive Products: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.

E. Products: Subject to compliance with requirements, provide one of the following:

1. Childers Brand, Specialty Construction Brands, Inc., a business of HB Fuller Company; CP-82.

2. Eagle Bridges – Marathon Industries;225.

3. Foster Brand, Specialty Construction Brands, Inc., a business of HB Fuller Company; 85-50.

F. For indoor applications, adhesive shall have a VOC content of 50g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

G. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

PART 3 EXECUTION

3.01 INSTALLATION.

A. General. Contractor shall install all insulation materials as specified herein for, ductwork that is not factory insulated. Insulation materials shall be installed in accordance with the manufacturer's written instructions and recommendations. Surfaces to be insulated shall be cleaned and dried. All work shall be performed within the temperature ranges recommended by the insulation product manufacturer. Insulation shall be kept clean and dry and shall remain in the factory container until it is installed. Packages or factory containers shall bear the manufacturer's stamp or label with the name of the manufacturer and description of materials.

Seams of exposed insulation and jackets shall be in the least visible location.

B. Ductwork Insulation. Insulation for ductwork shall be installed as specified herein and indicated on the drawings. Duct insulation shall be installed and fastened as recommended by the manufacturer.

Duct insulation shall be installed in as closest contact possible with the equipment surface and shall be secured with studs, pins, clips, adhesives, wires, or bands. Seams shall be sealed with joint sealing tape. A smooth coat of insulation cement shall be applied over the insulation except at removable sections.

Duct insulation shall be applied with interruptions for access to registers, grilles, diffusers, dampers, flanges, and other openings without disturbing the insulation. Boxouts with beveled and sealed edges shall be provided around registers, grilles, diffusers, and dampers.

C. Aluminum Jacketing. Aluminum jacketing for piping systems shall be installed as specified herein and indicated on the drawings. Jacketing shall be held in place

with stainless steel securing bands uniformly spaced at not more than 18 inches to produce tight joints without "bulging". The jacket shall overlap at least 2 inches at longitudinal and circumferential joints. Joints shall be overlapped and sealed with caulk to prevent moisture penetration, and longitudinal joints shall be placed to shed water. Exposed ends of pipe insulation shall be provided with covers constructed of the same material as the jacketing.

Elbows shall be jacketed with spirally wrapped aluminum strips or individual mitered segments or gores cut to fit the insulation.

3.02 INSULATION SCHEDULE.

INSULATION SCHEDULE				
		Mechanical Insulation		
Service	Size Inches [mm]	Type	Thickness Inches [mm]	Notes
DUCTWORK - INDOOR				
DUCTWORK	All	MF	Note (1)	(6)
Mechanical Insulation Types:	FC - Flexible Cellular MF - Mineral Fiber			

Notes:

(1) Aluminum jacket.

(2) Insulation shall be provided for portions of the piping system which pass through space above finished ceilings or is exposed above equipment, electrical panels, or cabinets.

(3) Insulation shall be provided for outside air plenums and ducts that are located upstream of the heating coil or pass through unheated spaces after the heating coil, unless indicated to be internally lined.

(4) Insulation shall be provided for outside air plenums and ducts, air conditioning supply and return ducts, and dehumidifier reactivation air discharge ducts, unless indicated to be internally lined.

(5) Insulation thickness shall be sufficient to provide a cold face temperature not to exceed 150°F.

Unless otherwise indicated in the insulation schedule, all mechanical piping, ductwork, equipment, and accessories with an operating temperature in excess of 140°F and below 60°F shall be insulated.

END OF SECTION

SECTION 15500
HEATING, VENTILATING, AND AIR CONDITIONING

PART 1 GENERAL

1.01 SCOPE

A. This section covers the furnishing and installation of heating, ventilating, and air conditioning (HVAC) equipment, devices, and appurtenances associated with the HVAC systems.

B. Piping, pipe supports, valves, and accessories which are not an integral part of the equipment or are not specified herein are covered in other sections.

1.02 GENERAL

Equipment furnished and installed under this section shall be fabricated, assembled, erected, and placed in proper operating condition in full conformity with the drawings, specifications, engineering data, instructions, and recommendations of the equipment manufacturer unless exceptions are noted by Resident Engineer.

A. Coordination. Contractor shall verify that each component of the system is compatible with all other parts of the system; that all piping, ductwork, materials, fans, and motor sizes are appropriate; and that all devices necessary for a properly functioning system have been provided.

1. Where two or more units of the same class of equipment are needed, they shall be the product of a single manufacturer; however, all the component parts of the system need not be the products of one manufacturer.

2. Where individual equipment paragraphs specify the requirement for local service, each manufacturer shall have a local service center, or with written consent of Resident Engineer, shall be able to provide service from other locations within 24 hours. The service center shall be equipped and staffed to service the system and shall maintain a local parts supply. Information on equipment manufacturers' representatives shall be included with the submittals.

3. Where several manufacturers' names have been listed in this section as possible suppliers, only the products of the first manufacturer listed have been checked for size, functions, and features.

B. General Equipment Stipulations. The General Equipment Stipulations shall apply to all equipment and materials furnished under this section. If requirements in this specification differ from those listed in other sections referenced herein, the requirements specified herein shall take precedence.

C. Governing Standards. Except as modified or supplemented herein, all work covered by this section shall be performed in accordance with all applicable

municipal codes and ordinances, laws, and regulations. In case of a conflict between this section and any state law or local ordinance, the latter shall govern.

All work shall comply with UL safety requirements.

D. Power Supply. Power supply to equipment with motors shall be as indicated in schedules on the drawings. Power supply for controls shall be 120 volts, 60 Hz, single phase unless otherwise required for a properly operating system.

E. Metal Thickness. Metal thickness and gages specified herein are minimum requirements. Gages refer to US Standard gage.

F. Mechanical Identification. Mechanical identification shall conform to the requirements of Specification Section 15050, "Basic Mechanical Systems Materials and Methods".

1.03 SUBMITTALS.

A. Drawings and Data

Complete assembly and installation drawings, and wiring and schematic diagrams, together with detailed specifications and data covering materials, parts, devices, and accessories forming a part of the equipment furnished, shall be submitted in accordance with Specification Section 01300, "Submittals" Device tag numbers indicated on the drawings shall be referenced on the wiring and schematic diagrams where applicable. The data and specifications for each unit shall include, but shall not be limited to, the following:

1. Fans

a) Name of manufacturer.

b) Type and model.

c) Construction materials, thickness, and finishes.

d) Overall dimensions and required clearances.

e) Net weight and load distribution.

f) Performance curves with the specified operating point clearly identified for each unit, type, and model, with capacity in cubic feet per minute as the abscissa and brake horsepower, static pressure, and efficiency as the ordinate. The fan curves shall include a family of curves for at least 3 different rotative speeds on a single chart.

g) Certified AMCA standard test code sound power output data for the fan outlet and casing when operating at the specified volume flow rate. Sound data shall list dB (re: 10-12 watts) in each octave band, with midrange frequencies starting at 63 Hz and ending at 8,000 Hz.

h) Where specified, information on equipment manufacturers' representatives.

2. Equipment (not specifically listed)

a) Name of manufacturer.

b) Type and model.

c) Construction materials, thickness, and finishes.

d) Manufacturer's performance data.

e) Overall dimensions and required clearances.

f) Net weight and load distribution.

g) Wiring diagrams.

3. Sheet Metal Ductwork

a) Sheet metal duct fabrication drawings indicating dimensions of individual shop and field fabricated sections, top and/or bottom duct elevations, joint locations, and dimensions of duct from walls or column rows.

b) Pressure and seal classifications.

c) Reinforcement types and spacing.

d) Joint and seam types.

e) Hanger and support types, spacing, and attachment methods.

f) Access panel and door construction, sizes, and locations.

g) Duct sealant, adhesive, gasket, and tape information.

h) Ductwork materials and thicknesses.

4. Temperature Controls

a) Published descriptive data on each item of equipment and accessories, indicating all specific characteristics and options and identified with the designation used herein and on the drawings.

b) Schematic control diagrams giving specific data on all settings, ranges, actions, adjustments, and normal positions. Although schematic, these diagrams shall, as closely as possible, represent the actual system with all significant equipment and devices identified and located relative to each other. These diagrams shall

also show detailed multiline wiring with all terminals accurately identified. The wiring diagrams shall show the internal connections of the temperature control panels and all field wiring to equipment remote from the control panels, including wiring to City-furnished equipment. The wiring diagrams shall be complete, showing all connections necessary to place the temperature control systems in operation. Wiring diagrams shall be detailed to the degree necessary for field construction and shall include all related wiring.

c) Sequence of operation for each system corresponding to the control schematics.

d) Space thermostat schedule indicating the types of covers and means of adjustment for each space.

e) Conduit and wire types.

f) Where specified, information on equipment manufacturers' representatives.

B. Operation and Maintenance Data and Manuals

Adequate operation and maintenance information shall be supplied as required in Specification Section 01730, "Operations and Maintenance Manuals". Operation and maintenance manuals shall be submitted in accordance with Specification Section 01300, "Submittals". The operation and maintenance manuals shall be in addition to any instructions or parts lists packed with or attached to the equipment when delivered.

In addition to the requirements of the Operation and Maintenance section, the operation and maintenance manuals shall include a listing of all filter locations, types, sizes, and quantities associated with each piece of equipment.

1.04 QUALITY ASSURANCE

A. Quality assurance shall comply with the requirements of the Specification Section 15020, "Basic Mechanical Building Systems Materials and Methods".

1.05 DELIVERY, STORAGE, AND HANDLING

A. Shipping shall be in accordance with Specification Section 01612, "Shipping". Handling and storage shall be in accordance with Specification Section 01614," Handling and Storage".

1.06 EXTRA MATERIALS

A. Extra materials shall be furnished for the equipment as specified in the individual equipment paragraphs.

B. Extra materials shall be packaged with labels indicating the contents of each package. Each label shall indicate manufacturer's name, equipment name, equipment designation, part nomenclature, part number, address of nearest distributor, and current list price. Extra materials shall be delivered to City as directed.

C. Extra materials subject to deterioration such as ferrous metal items and electrical components shall be properly protected by lubricants or desiccants and encapsulated in hermetically sealed plastic wrapping.

PART 2 MATERIALS

2.01 SERVICE CONDITIONS

A. All equipment shall be designed and selected to meet the specified conditions.

2.02 PERFORMANCE AND DESIGN REQUIREMENTS

Equipment and coil capacities shall be as indicated on the schedules. Where equipment is provided with protective coatings, unit capacities shall be corrected to account for any efficiency losses from the selected protective coating.

Each fan's operating selection point on the fan curves shall be selected to the right of the peak pressure/efficiency point and below the lowest point along the fan curve to the left of the peak pressure/efficiency point.

A. Dimensional Restrictions.

Layout dimensions will vary between manufacturers and the layout area indicated on the drawings is based on typical values of the first manufacturer listed. Contractor shall review the contract drawings, the manufacturer's layout drawings, and installation requirements and shall make any modifications required for proper installation subject to acceptance by Resident Engineer. At least 3 feet of clear access space shall be provided on all sides of the unit unless otherwise indicated.

B. Elevation.

Equipment shall be designed to operate at the elevation as indicated on the drawings.

2.03 ACCEPTABLE MANUFACTURERS

A. Acceptable manufacturers shall be as listed in the respective product description paragraphs.

2.04 HVAC MATERIALS

A. Fans

Fans shall be rated in accordance with AMCA standards, shall be licensed to bear the AMCA Certified Rating Label unless otherwise indicated in the Fan Schedule on the drawings, and shall be UL listed.

Each fan shall be complete with an electric motor, factory mounted safety disconnect switch with wiring to the motor, drive, and accessories required for satisfactory operation. Belt-driven fans shall be complete with a V-belt drive designed for 50 percent overload capacity, sheaves, adjustable base or rails for belt tightening, and a belt guard. Adjustable pitch sheaves shall be furnished for fans with less than 10 horsepower motors and fixed sheaves for 10 horsepower and larger motors. Adjustable sheaves shall be selected so that the fan speed at the specified conditions is at the mid-position of the sheave range. Sheaves shall be replaced with sheaves of the proper size after the air system balancing if necessary, to provide the required fan speed for the specified airflow.

Fan drive motors shall be as specified in the Electrical paragraph, unless otherwise indicated. Fans shall be suitable for use with the power supply indicated on the drawings.

Fans indicated in the schedules on the drawings to be explosion proof shall be suitable for installation in a NEC Class I, Division 1 and 2, Group D environment.

The external static pressure values indicated in the schedules on the drawings are external to the complete unit. Internal fan housing and when furnished, backdraft damper and filter losses are not included. An allowance of 0.35-inch water column shall be used for pleated filter losses.

A solid state variable speed controller shall be provided for each direct-driven fan motor less than 1/2 hp to balance the fan airflows to the specified rates. The speed controller shall have a capacity range of approximately 50 through 100 percent of the design airflow rate specified. The speed controller shall be mounted on or in the fan housing unless otherwise indicated.

Where indicated in the schedules on the drawings, fans shall be given a protective coating resistant to the corrosive atmosphere indicated.

1. Extra Materials

Extra Materials	Quantity
Sets of matched belts per fan	1
Sets of air filters per fan	2

B. Backdraft Dampers

Backdraft dampers, denoted by the symbol "BDD" not specified to be furnished with equipment, shall be Arrow United Industries "Type 655", or

Ruskin "BD6". Backdraft dampers shall be constructed with a 1 by 4 inch by 0.081-inch-thick extruded aluminum frame. Blades shall be of 0.081-inch aluminum, with silicone rubber seals on the edges, and with aluminum shafts and ball bearings.

C. Control Dampers

Control dampers shall be denoted by the symbol "CD" and an identifying number. Dampers with an area larger than 25 square feet or with any blade dimension exceeding 48 inches shall be built in sections. All dampers shall be carefully inspected before and after installation, and any damper having poorly fitted blades, insufficient framed rigidity, or excessive clearance or backlash in moving parts will be rejected and shall be replaced with an acceptable unit.

Two-position dampers shall have parallel operating blades. Modulating dampers shall have opposed operating blades.

Damper blades shall be installed on a steel shaft operating in synthetic bearings suitable for industrial service. Dampers shall be close-fitting and shall be designed to offer minimum resistance to the airflow when in the fully open position. Damper blade linkage shall be concealed in the frame.

Control dampers shall be given a protective coating identical to the coating applied to the connected ductwork and equipment.

a) Wall Mounted Control Dampers.

Control dampers mounted in walls behind louvers shall be Arrow United Industries "Type AFD-20" or Ruskin "CD-40". Control damper frames shall be constructed of 4 by 1 inch 6063 T5 extruded aluminum. Damper blades shall be constructed of 4-inch-wide airfoil-shaped extruded aluminum.

D. Damper Operators

The damper operators shall be direct coupled or foot-mounted type. Where foot-mounted type operators are used, each operator shall be complete with all necessary crank arms, ball joint connectors, push rods, linkages, and mounting brackets.

Each operator shall have sufficient torque to operate the connected control damper area. Each damper operator shall have at least a 50 inch-lb normal running torque. Where the required damper torque exceeds the damper operator running torque rating, multiple operators or operators with a greater running torque shall be furnished to produce the torque required to operate the damper. Control dampers shall fail to the closed position unless otherwise indicated on the drawings.

Two-position direct coupled electric damper operators shall be Belimo "NF120-S" or "AF120-S", Honeywell "MS4100 Series", or Johnson Controls. Foot-mounted

type electric damper operators shall be Honeywell "Model M4185", or Johnson Controls "Model M100". Two-position electric damper operators in hazardous areas shall be installed in explosion proof housings.

Damper operators shall be spring return and shall have one internal spdt auxiliary switch rated 5 amperes at 120 volts ac or the power supply available from the temperature control system furnished. Damper operators shall be suitable for operation on a 120 volt, 60 Hz, single phase power supply. Auxiliary transformers, where required, shall be factory wired to the damper operator and installed in a NEMA Type 1 enclosure fastened to the motor housing.

1. Direct coupled two position electric damper operators shall be housed in a galvanized steel or aluminum case. Operators shall use a "V" shaped bolt and cradle design to eliminate slippage on the damper shaft. Single bolt or set screw type designs are not acceptable. The operators shall be suitable for direct mounting to shafts up to 1 inch and shall be complete with mounting brackets and damper position indicator.

2. Foot-mounted type two-position electric damper operators shall be housed in a die-cast aluminum case with a mounting flange. Motor and gear train components shall be immersed in oil. Damper operators shall have a 3/8 inch square, double-ended drive shaft.

E. Air Outlet and Inlet Devices

Air outlet and inlet devices shall be manufactured by Krueger, Price, Tuttle & Bailey, or Titus. Air outlet and inlet devices shall be furnished and installed where indicated on the drawings.

Where air outlet and inlet devices are installed in ductwork given a protective coating, an identical coating shall be applied to the air outlet and inlet devices.

1. Registers and Grilles

Registers and grilles shall be constructed of aluminum or steel as indicated in the schedules on the drawings. The front blades of adjustable blade models shall be parallel to the short dimension unless otherwise indicated, and the front blades of fixed blade models shall be horizontal unless otherwise indicated. All registers shall be furnished with key-operated opposed blade dampers. The dampers shall be constructed of the same material as the attached grille.

2. Flexible Connections

Flexible connections located indoors shall be Ventfabrics "Ventglas". Flexible connections installed outdoors or exposed to sunlight or weather shall be Ventfabrics "Ventlon".

Ductwork connections to the air handling equipment, and where indicated on the drawings, shall be made using fabric connectors with sheet metal

collars. The fabric shall be fire resistant, waterproof, mildew-resistant, and airtight. At least 3 inches of fabric shall be exposed. Flexible connections shall be in accordance with the requirements of UL and NFPA.

Fabric for flexible connections protected from sunlight and the weather shall be suitable for a temperature range of -20 to 180°F and shall weigh at least 27 ounces per square yard.

Fabric for flexible connections exposed to sunlight or the weather shall be suitable for a temperature range of -10 to 250°F and shall weigh at least 24 ounces per square yard.

F. Air Filtration Equipment

1. Pleated Air Filters

Pleated air filters shall be American Air Filter "AM-AIR 300X" or Farr "30/30". Filters shall be disposable type, high-loft blend of cotton and synthetic fiber pleated media. The media shall be rated as Class 1 or Class 2 in accordance with UL 900. A metal support grid shall be bonded to the media. The filter frame shall be constructed of rigid, high-strength, moisture-resistant beverage board. The pleated media pack shall be bonded to the inside of the frame. All filters shall have an average efficiency of 25 to 30 percent based on the ASHRAE 52.1 test method.

Pleated filters shall be two inch filters, and shall have at least 12 pleats per linear foot and at least 4.2 square feet of media per square foot of filter area. Two inch filters shall have a maximum initial resistance of 0.13 inch wc at 300 feet per minute.

G. Duct Silencers

Not used.

H. Sheet Metal Ductwork.

Ductwork, accessories, bracing, and supports shall be constructed of galvanized steel. Where more than one material is indicated, ductwork, accessories, bracing, and supports shall be constructed of galvanized steel unless otherwise indicated on the drawings. Ductwork, turning vanes, and other accessories shall be fabricated in accordance with the latest SMACNA HVAC Duct Construction Standards. Accessories, bracing, and supports shall be constructed of similar materials as the ductwork.

Galvanized ductwork located in air conditioned spaces shall be constructed of G-60 or better lockforming quality in accordance with ASTM A653. All other galvanized ductwork shall be constructed of G-90 or better galvanized steel. All welds on galvanized metal shall be cleaned and coated with a zinc-rich paint.

Fan boxes shall be submitted in accordance with Specification Section 01300, "Submittals".

Sealants shall be suitable for the duct service and shall maintain leakage integrity at pressures in excess of the ductwork pressure classification.

Where indicated on the drawings, ductwork and accessories shall be given a protective coating resistant to the corrosive atmosphere indicated.

I. Duct Insulation

Refer to Specification Section 15250, "Mechanical Insulation".

J. Access Doors

Access doors shall be fabricated in accordance with the latest SMACNA HVAC Duct Construction Standards. Access doors shall be double skin insulated type for insulated ductwork and single skin type for noninsulated ductwork. Insulated doors shall be insulated with the same thickness insulation as the duct in which it is installed. Duct-mounted access doors and panels shall be fabricated of the same material as the ductwork, with sealing gaskets and quick-fastening locking devices. Where access doors are insulated, a sheet metal cover shall be installed over the insulation.

K. Temperature Controls

The temperature control components and systems shall be manufactured by Honeywell; Johnson Controls; or Siemens Building Technologies, Landis Division. Where manufacturers are not specified, materials and equipment furnished shall meet the performance and design requirements indicated

1. Performance and Design Requirements

Contractor shall coordinate with the Work to make certain that the field wiring associated with the work of this section is completed in accordance with the requirements of the heating, ventilating, and air conditioning equipment furnished and their interconnection. Where cable and conduit is not indicated on the drawings but is needed for a complete and functional control system in accordance with the sequence of operation it shall be provided as specified herein. The control wiring shall be installed so that all HVAC equipment will function as described in the HVAC sequence of operation.

Conduit and control wiring for all control circuits needed between all field mounted HVAC controlling and indicating devices, such as, but not limited to, damper actuators, thermostats, temperature control panels, pressure differential switches, control switches, motor starters, and the HVAC equipment, shall be furnished and installed as specified in the Electrical Wiring paragraph. Cable and conduit for all HVAC power circuits shall be as specified in the Electrical section.

2. Tolerances

Unless otherwise indicated, the controls shall maintain space temperatures within ±2°F, and the relative humidity within ±5 percent of the setpoint.

3. Thermostats

Where indicated on the drawings, thermostats shall be constructed of materials resistant to or shall be protected from the corrosive atmosphere indicated. Thermostats specified in the individual equipment paragraphs shall be provided with the respective equipment.

a) Two Position Wall Mounted Thermostats. Two position wall mounted thermostats shall be Honeywell "T631A Airswitch", Penn Controls "A19BAC-1", or Siemens Building Technologies.

Two position wall mounted thermostats shall be line voltage type. The thermostats shall have a range of approximately 35°F to 100°F with a nonadjustable differential of 3.5°F The thermostats shall have a spdt switch rated for 1 horsepower,

b) Two Stage Wall Mounted Thermostats. Two stage wall mounted thermostats shall be Honeywell "T631B Airswitch", Penn Controls "A28AA-4", or Siemens Building Technologies.

Two stage wall mounted thermostats shall be line voltage type. The thermostats shall have a range of approximately 35°F to 100°F with a nonadjustable differential of 2°F for each stage and 3.5°F between stages

4. Accessory Components

All additional control components, including, but not limited to, electric relays, temperature sensors and transmitters, humidity sensors and transmitters, controllers, and position switches, shall be furnished where necessary to ensure a complete, properly operating installation. All components shall be products of the temperature control manufacturer. Accessory components not mounted inside the temperature control panels shall be furnished with equipment enclosures. Relays shall be provided with 120 volt coils and at least 10 ampere contacts.

5. Electrical Wiring

Detailed wiring diagrams shall be submitted in accordance with Specification Section 01300, "Submittals". The wiring diagrams shall show the internal connections of the control panels and all field wiring to equipment remote from the control panels including wiring to City-furnished equipment. The wiring diagrams shall be complete, showing all connections necessary to place the temperature control systems in operation.

Control wiring shall be in accordance with the National Electric Code (NEC). Cable shall be multi-conductor, at least 18 AWG size, specifically designed for industrial systems and UL listed for indoor/outdoor installations.

Conduit for all HVAC control circuits in exposed indoor locations shall be rigid steel or intermediate metal, except in areas designated on the electrical drawings as Area Type 1A. Exposed conduit shall be rigidly supported by hot-dip galvanized hardware and framing materials, including nuts and bolts. In areas designated Type 1A, exposed conduit shall be rigid Schedule 40 PVC non-metallic conduit with PVC fittings, boxes, and accessories. Conduit installed in floor slabs and walls in non-hazardous (classified) locations shall be rigid Schedule 40 PVC. All conduit and conduit installation shall be in accordance with the requirements of the Electrical section and NEC.

2.05 ELECTRICAL

A. Electric motors and motor controls shall conform to Specification Section 15050, "Basic Mechanical Building Systems Materials and Methods". Motor starters, disconnects and controls shall be furnished and installed under the applicable Electrical specification section, except for equipment specified or furnished with prewired integral starters. All electrical controls shall have enclosures suitable for the environment and NEMA rating as indicated on the electrical drawings. Equipment installed outdoors shall have NEMA Type 4 enclosures.

2.06 DRIVE UNITS

A. Electric motors, V-belt drives, and safety guards shall be in accordance with the requirements of Specification Section 15050, "Basic Mechanical Systems Materials and Methods".

2.07 MANUFACTURE AND FABRICATION

A. Manufacture and fabrication shall comply with the requirements of Specification Section 15050, "Basic Mechanical Systems Materials and Methods".

2.08 SHOP TESTING

A. The equipment furnished under this section shall be tested at the factory according to the standard practice of the manufacturer. Ratings shall be based on tests made in accordance with applicable AMCA, ASHRAE, ARI, NBS, NFPA, and UL Standards.

2.09 BALANCE

A. All rotating parts shall be accurately machined and shall be in as nearly perfect rotational balance as practicable. Excessive vibration shall be sufficient course for rejection of the equipment. The mass of the unit and its distribution shall be such that the resonance at normal operating speeds is avoided. In any case, the

maximum measured root-mean-square (rms) value as measured at any point on the equipment shall not exceed those listed in the latest ASHRAE Applications Handbook.

B. At any operating speed, the ratio of rotative speed to the critical speed of a unit or components thereof shall be less than 0.8 or more than 1.3.

PART 3 EXECUTION

3.01 INSPECTION

A. Equipment installed in facilities with limited access shall be suitable for being installed through available openings. Contractor shall field verify existing opening dimensions and other provisions for installation prior to submittal of bids.

B. Where penetrations through existing concrete slabs are made, the Contractor shall locate and avoid damage to all rebar, embedded conduit, etc. when making new openings.

3.02 PREPARATION

A. Field Measurement

1. Contractor shall be responsible for verifying all field dimensions, and for verifying location of all equipment relative to any existing equipment or structures.

B. Surface Preparation

1. All surfaces to be field painted shall be dry and free of dirt, dust, sand, grit, mud, oil, grease, rust, loose mill scale, or other objectionable substances, and shall meet the recommendations of the paint manufacturer for surface preparation. Cleaning and painting operations shall be performed in a manner which will protect freshly painted surfaces from dust or other contaminants. Oil and grease shall be completely removed by use of solvents or detergents before mechanical cleaning is started. The gloss of previously painted surfaces shall be dulled if necessary for proper adhesion of top coats.

2. Surface finish damaged during installation shall be repaired to the satisfaction of Resident Engineer. Field painting shall be as specified in Specification Section 09900, "Painting and Coating".

3.03 INSTALLATION

Equipment and materials furnished under this section shall be installed in proper operating condition in full conformity with the drawings, specifications, engineering data, instructions, and recommendations of the equipment manufacturer, unless exceptions are noted by Resident Engineer.

A. Fans

1. Where indicated on the drawings, flexible connections shall be installed between fan inlet and outlet sheet metal connections. Flexible connections shall not be in tension when the fans are operating. Where fan inlets and outlets are exposed, safety screens shall be installed over the opening. Scroll drains for equipment installed indoors shall be piped to the nearest floor drain.

B. Damper Operators

1. Damper operators shall be installed on a mounting bracket rigidly attached to the damper frame or duct. Where the bracket attaches to the duct, suitable stiffeners shall be installed on the duct to prevent noticeable deflection of the duct when the damper operates. Damper operators may be installed inside or outside the duct but consideration shall be given to the environment and duct dimensions in which the operators are installed. Where the damper installation inside the duct may or actually prevents the design airflow from being achieved, the damper operator shall be installed outside the duct. Damper operators shall be readily accessible and access doors shall be provided when the operator is installed inside the duct.

2. The number of operators furnished for each damper shall provide the torque necessary to operate the damper. Unless otherwise indicated, control dampers shall fail to the closed position.

C. Air Outlet and Inlet Devices

1. Air outlet and inlet devices shall be installed level and plumb and in accordance with the manufacturer's written instructions.

D. Sheet Metal Ductwork

1. Ductwork, turning vanes, and other accessories shall be installed and supported in accordance with the latest SMACNA Duct Construction Standards. The locations, arrangement, and sizes of ductwork shall be as indicated on the drawings. The duct sizes indicated are clear dimensions inside the duct or duct lining. Sheet metal sizes are larger for ductwork with interior linings.

2. Ductwork shall be fabricated, reinforced, supported, and sealed for the operating pressures indicated in the schedules for the connected equipment. All ductwork shall have a pressure classification of at least 1 inch.

3. Sheet metal ductwork shall be sealed according to the classifications described in the SMACNA HVAC Duct Construction Standards in accordance with the following:

Duct Location	Duct Type			
	Supply			
	≤ 2 inches wc	> 2 inches wc	Exhaust	Return
Outdoors	A	A	A	A
Unconditioned Areas	B	A	B	B
Conditioned Spaces				
(concealed ductwork)	C	B	B	C
(exposed ductwork)	A	A	B	B
Sealing Levels A - All transverse joints, longitudinal seams, and duct wall penetrations B - All transverse joints and longitudinal seams C - Transverse joints only				

4. All joints, seams, connections, and penetrations in ductwork located outdoors shall be sealed watertight and weatherproof. Transverse joints shall be flanged and shall be provided with a continuous gasket and flange cap.

5. Ductwork shall be supported as required by SMACNA. Where ductwork is connected to equipment, it shall be independently supported with no weight bearing on the equipment and in such a manner that the equipment maybe removed for service without temporary support of the ductwork. Ductwork shall be supported within 24 inches of each elbow and within 48 inches of each branch intersection. Strap or wire hangers shall not be used where the hanger length exceeds 5 feet.

6. Ductwork shall be constructed and installed in accordance with the drawings. When acceptable to City, modifications in the size and location of ductwork may be made where required to avoid interference with the building structure, piping systems, or electrical work. The installation shall be coordinated with other phases of work to establish space and clearance requirements. Unless otherwise indicated by a bottom of duct elevation, all ductwork shall be routed as high as possible, with a minimum height of 8 feet above the finished floor. Ductwork installed above suspended ceilings shall be installed with at least 8 inch lighting allowance between the ceiling and the bottom of the ductwork.

7. In vertical ducts with a closed bottom which terminate less than 24 inches above finished floor, the bottom of the ductwork shall be broken and sloped to a 1/2-inch drain hole in the bottom of the duct.

8. Single-thickness turning vanes shall be installed in all turns with 45 degree or greater angles. Turning vanes shall be minimum 4.5-inch radius type for vanes 30 inches and longer.

E. Duct Insulation

1. Insulation materials shall be installed in accordance with the manufacturer's written instructions and recommendations. Surfaces which are to be insulated shall be cleaned and dried. Insulation shall be kept clean

and dry and shall not be removed from the factory container until it is installed. Packages or factory containers shall have the manufacturer's stamp or label bearing the name of the manufacturer and description of the contents.

2. Insulation shall be terminated at items mounted in ductwork such as thermometers, controls, damper linkages, flexible connections, access doors, etc., to avoid interference with their function and/or replacement.

3. The following ducts shall be insulated with exterior duct wrap:

Location	Ductwork	Insulation Thickness
Exterior	a. All ductwork	2 inches
Interior within conditioned space (heated or cooled)	a. Heating supply and return	1 inch
	b. Cooling supply and return	1 inch
	c. Heating and cooling supply and return	1 inch
Interior within conditioned space (heated or cooled)	d. Makeup air outside area served	1 inch
	e. Outside air (including plenums)	1.5 inches
Interior within unconditioned space	a. Heating supply and return	1.5 inches
	b. Cooling supply and return	1.5 inches
	c. Heating and cooling supply and return	1.5 inches
	d. Makeup air outside area served	1.5 inches
	e. Outside air (including plenums)	2 inches

F. Access Doors

1. Airtight access doors shall be provided for inspection of all dampers, operators, filters, smoke detectors, duct-mounted coils, and at other locations indicated on the drawings. The access doors shall be of a size suitable for the duct dimensions and at least 8 inches square for hand access, 18 inches for shoulder access, or as indicated on the drawings. Each access door shall be installed to open against the pressure in the duct.

G. Temperature Controls

1. Automatic temperature controls shall be furnished and installed as indicated on the drawings and as specified herein.

2. Contractor shall be responsible for determining that all equipment supplied is suitable for installation in the space indicated on the drawings. Control equipment shall be installed with adequate space for operating and maintenance access.

H. Thermostats

1. Wall-mounted thermostats shall be mounted above the finished floors as indicated in the Electrical section. Insulating spacers shall be provided for thermostats mounted on exterior building walls. The spacers shall be installed between the thermostat and its mounting surface, so that the thermostat will not be affected by surface temperatures.

2. Wall-mounted thermostats in non-air-conditioned areas shall be furnished and installed with a cast aluminum or wire guard.

3.04 FIELD QUALITY CONTROL

A. Installation Check

1. An installation check by an authorized representative of the manufacturer is not required for equipment specified in this section.

B. Startup and Testing

1. After the equipment and systems have been installed, adjusted, and balanced, tests shall be conducted to demonstrate that each system is functioning as specified and to the satisfaction of Resident Engineer. Tests shall be as indicated in Specification Section 01650, "Startup Requirements".

2. If inspection or tests indicate defects, the defective work or material shall be replaced, and inspection and tests repeated. All repairs to piping shall be made with new materials. Caulking of threaded joints or holes will not be acceptable.

3.05 CLEANING

A. At the completion of the testing, all equipment, pipes, ductwork, valves, and fittings shall be cleaned of grease, debris, metal cuttings, and sludge. Any stoppage, discoloration, or other damage to parts of the building, its finish, or furnishings shall be repaired by Contractor at no additional cost to City.

END OF SECTION

be possible over modem from a facility that is remote from the generator set.

2. The software shall be capable of storing and displaying data for any function monitored by the generator set control. This data shall be available in common file formats, and on graphical "strip chart" displays.

3. The software shall automatically record all control operations and adjustments performed by any operator or software user, for tracking of changes to the control.

4. The software shall display all warning, shutdown, and status changes programmed into transfer switch controller. For each event, the control shall provide information on the nature of the event, when it last occurred, and how many times it has occurred.

END OF SECTION

SECTION 16400
LOW VOLTAGE ELECTRICAL SERVICE AND DISTRIBUTION

PART 1 -- GENERAL

1.1 WORK OF THIS SECTION

A. The Contractor shall provide all electrical service sections, distribution switchboards, special control panels, control and terminal cabinets, control devices, circuit breakers, and all appurtenant work, complete and operable, in accordance with the Contract Documents.

1.2 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

A. Without limiting the generality of other requirements of these Specifications, all work specified herein shall conform to or exceed the applicable requirements of the National Electrical Code (NEC); provided, that where a local code or ordinance is in conflict with the NEC, the provisions of said local code or ordinance shall take precedence.

B. Codes:

1. NEC	National Electrical Code

C. Commercial Standards:

1. ANSI/IEEE C37.20	Switchgear Assemblies, including Metal-Enclosed Bus
2. ANSI/NEMA ICS-2 Control	Devices, Controllers, and Assemblies for Industrial
3. ANSI/UL 1008	Automatic Transfer Switches, Safety Standard for
4. IEEE	Institute of Electrical and Electronic Engineers
5. NFPA	National Fire Protection Association
6. UL	Underwriters' Laboratories, Inc.
7. UL	National Electrical Manufacturer's Association

1.3 RELATED SECTIONS

A. The Work of the following Sections applies to the Work of this Section. Other Sections, not referenced below, shall also apply to the extent required for proper performance of

this Work.

1. Section 16050 Basic Electrical Materials and Methods
2. Section 16950 Electrical Tests

1.4 OPERATION AND MAINTENANCE

A. The Contractor shall submit operation and maintenance information in accordance with Section 01730 - *Operations and Maintenance Data.* The submittal shall be supplemented by written text and shall include the following:

1. Operating procedures.
2. Maintenance procedures.
3. Manufacturers parts list, illustrations, assemblies, and diagrams.

1.5 CONTRACT SUBMITTALS

A. The Contractor shall submit shop drawings of the service section and switchboards in accordance with Section 01300 - *Submittal*s.

B. After review by the Resident Engineer, the shop drawings of the service section shall be submitted to the utility company for approval before fabrication.

PART 2 -- PRODUCTS

2.1 GENERAL

A. Materials: All materials and equipment furnished under this Section shall be new; they shall be in accordance with the requirements of the Institute of Electrical and Electronic Engineers, the National Electrical Manufacturer's Association, the National Fire Protection Association, and the National Electrical Code. Where available, all materials and equipment shall bear the Underwriters' Laboratories label.

B. Equipment: All equipment for the same purpose shall be of the same make.

C. Enclosure Requirements: All outdoor equipment, fixtures, and wiring devices shall be of approved, weatherproof construction.

D. Standard Products: Materials and equipment submitted for approval shall be the cataloged products of companies regularly engaged in the manufacture of such items, of the latest standard design that conforms to the specification requirements, and shall essentially duplicate material and equipment that has been in satisfactory use for several years.

2.2 SWITCHBOARD

A. Indoor Construction: Indoor construction shall be of the universal frame type using die-formed welded and bolted members. Enclosing panels shall be 14-gage steel, bolted in place. In addition, indoor construction shall conform to the following:Switchboard shall be totally enclosed, NEMA 1, gasketed.

B. Bus bar shall be copper fully insulated. Copper shall be silver plated at joints. Bus bars shall be braced for short circuits of 65,000 A minimum, or more if so indicated. A full length copper ground bus bar shall be provided at the bottom of the switchboard enclosure.

C. Floor-Standing Switchboards: Floor-standing distribution switchboards, and main service switchboard, shall be cataloged products of the main circuit breaker manufacturer. Switchboard shall be shipped fully assembled and tested.

2.3 MAIN SERVICE SWITCHBOARD

A. General: The main service switchboard shall consist of a free-standing assembly which complies with the Contract Documents, with particular reference to the provisions of the above paragraph entitled, "Switchboard." The main switchboard shall be UL listed as suitable for utility type service entrance, 480/277 V 3-phase, 4 wire.

B. Switchboard: Switchboards shall be front accessible. Switchboards shall be constructed to accommodate additional distribution sections. The switchboards shall consist of the sections described in the following paragraphs.

C. Service Section: The service section shall consist of an underground pull compartment and a revenue metering compartment all to utility requirements. Components such as meter bases, busses, lugs, auxiliaries, shall be provided.

D. Main Circuit Breaker Compartment:

1. The main circuit breaker compartment's circuit breaker unit shall have the ratings indicated. Service neutral shall be brought to a terminal in the main circuit breaker compartment. A disconnecting link shall be provided in a bus bar connection between the neutral terminal and the switchboard ground bus.

2. The circuit breaker shall have protective features with capability of selective tripping which can be used to provide overcurrent protection from overloads, short circuits, and ground faults. In addition, the Main Circuit Breaker shall be equipped with a shunt trip.

E. The circuit breaker shall be individually mounted stationary of the size and type indicated.

F. Manufacturer: The main switchboard shall be manufactured by Cutler-Hammer Pow-R-

Line C, General Electric AV-Line or equal by Square D, Siemens or equal.

2.4 SWITCHBOARD INSTRUMENTS

A. Indicating Meters: Indicating meters shall be of the following type and manufacture, or equal:

1. Main Incoming Circuit Breaker:

a. Westinghouse IQ Data Plus
b. Multilin MTM Plus

B. Requirements: The instrument transformer shall comply with ANSI/IEEE C37.20-Switchgear Assemblies Including Metal-Enclosed Bus and shall have standard accuracy for relaying with the burdens imposed. Mechanical and thermal ratings of current transformers shall be coordinated with short circuit ratings of related circuit breakers. Potential transformers shall be mounted on a disconnecting rack and shall have primary fuse protection.

C. Relays: The protective relays shall be mounted within draw-out cases; current measuring circuits shall be fitted with jacks to short circuit current transformers when relays are withdrawn. The relays shall have means for testing measuring circuitry with the relay in place. The relays shall be solid state type and the product of the switchboard manufacturer.

2.5 OVERCURRENT PROTECTIVE DEVICES

A. Circuit Breakers with a Frame Size of 150 A or Less: Circuit breakers having a frame size of 150 A or less shall be molded-case type with thermal, magnetic, noninterchangeable, trip-free, sealed trip units. The breaker contact material shall be a non-weldable silver alloy. The breakers shall have arc-extinguishing chutes. Ground fault tripping, where required, shall be as indicated in Subsection 16400-2.7B.

B. Circuit Breakers with a Frame Size of 225 to 600 A: Circuit breakers with a frame size of 225 to 600 A shall be molded case with interchangeable thermal and adjustable magnetic trip elements. Ground fault protection shall be provided by means of a core balance transformer encircling all feeder leads. The transformer shall energize a surface-mounted, solid-state relay, adjustable from 10 to 20 percent of phase current with an adjustable time delay of zero to 36 cycles. Ground fault protection shall include a test panel containing indication and test tripping circuits.

C. Circuit Breakers with a Frame Size of 600 A or More: Circuit breakers with a frame size more than 600 A shall be molded case, except if power circuit breakers are indicated. Molded case circuit breakers shall have an integral, solid state over-current trip unit and line current sensors. Trip units shall have adjustable long time tripping in the range of 60 to 100 percent of continuous rating, instantaneous tripping adjustable in the range of 300

to 1000 percent of continuous rating, and ground fault tripping adjustable in the range of 20 to 60 percent of continuous rating, with adjustable delay of approximately 5 to 40 cycles. In addition, the circuit breaker shall be equipped with a shunt trip if required.

PART 3 -- EXECUTION

3.1 INSTALLATION - GENERAL

A. General: All electrical equipment shall be installed securely in place. Equipment shall be mounted parallel and perpendicular to the walls, floors, and ceilings.

B. Anchors: All anchors and fasteners shall be types designed for the intended purpose and shall be capable of adequately, safely, and permanently securing the material in place. Generally, screws shall be used on wood surfaces, masonry anchors in concrete or brick, toggle bolts on hollow walls, machine screws, bolts, or welded studs on steel. Nails shall be used only for temporary attachment or support.

C. Omissions or Conflicts: Omissions or conflicts on the Drawings or between Drawings and Specifications shall be brought to the attention of the Resident Engineer for clarification before proceeding with the work.

D. Preparation: The Contractor shall make all necessary provisions throughout the site to receive all equipment as construction progresses and shall furnish and install adequate backing, supports, inserts, and anchor bolts for the hanging and support of all electrical cabinets, enclosures, conduits, panelboards, and switches, and shall furnish and install sleeves through walls, floors, or foundations where electrical lines are required to penetrate.

E. Leveling: Floor-standing equipment shall be leveled with shims as required to maintain horizontal surfaces within 1/32 inch per horizontal foot; after leveling, equipment shall be anchored, then grouted so that no space exists between concrete and equipment support beams.

3.2 PREPARATION AND FINISH SYSTEMS

A. Equipment cabinets and enclosures furnished under this Section shall have a finish that conforms to Section 16050, *Basic Electrical Materials and Methods*.

END OF SECTION

DIVISION 16420
REDUCED VOLTAGE MOTOR CONTROLLERS

PART 1 PRODUCTS

1.01 DIVISION INCLUDES

A. Configured reduced voltage AC soft start controllers for use with NEMA B design AC squirrel-cage induction motors.

1.02 SUBMITTALS

A. Submit the following in accordance with Section 01300 *Submittals:*

1. Catalog Data: Submit catalog data describing each type of controller. Include data substantiating that materials comply with specified requirements. Provide catalog sheets showing voltage, controller size, ratings and size of switching and overcurrent protective devices, short circuit ratings, dimensions, and enclosure details.

2. Certification: Submit certification by manufacturer's field technical representative that the subcontractor has installed, adjusted, and tested each controller according to the manufacturer's recommendations.

3. Shop Drawings: Submit shop drawings for each controller including dimensioned plans and elevations and component lists. Include front and side views of enclosure showing overall dimensions, enclosure type, enclosure finish, unit locations, and conduit entrances.

4. Installation Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, installation, and starting of Product.

5. Operation and Maintenance Instructions: Submit operation and maintenance instructions in accordance with Section 01730, Operation and Maintenance Data.

6. Test Reports: Submit results of required factory tests.

7. Warranty: Provide a 3-year parts warranty, on materials and workmanship, and 1-year labor warranty from the date of field certification by manufacturer's representative of satisfactory operation.

1.03 QUALITY ASSURANCE

A. Comply with the *National Electrical Code* (NEC) for components and installation.

B. Provide products that are listed and labeled by a Nationally Recognized Testing Laboratory (NRTL) for the application, installation condition, and the environment in which installed.

C. The manufacturer's turn around period to repair or replace the reduced voltage motor controller shall be no more than 36 hours.

D. Perform the following factory tests on each controller:

1. Test every power converter (a component of the controller) with an actual AC induction motor 100% loaded and temperature cycled to the full range of the reduced voltage motor controller. Monitor the power converter for correct phase current, phase voltages, and motor speed. Verify current limit operation by simulating a motor overload.

2. Verify proper factory presets by scrolling through all parameters to ensure proper microprocessor settings. Verify proper functioning of all input and output ports.

3. Test all door mounted pilot devices to verify proper function.

4. Functionally test all options including operation of a motor in the bypass mode if supplied. Verify proper setting of motor overload protection.

5. Test the controller wiring for continuity, shorts, and unintended grounds with all enclosed devices mounted and wired.

1.04 COORDINATION

A. Coordinate the features of each controller with the ratings and characteristics of the supply circuit, the motor, the required control sequence, the duty cycle of the motor, drive, load, and control circuit affecting controller functions. Furnish controller rated to suit the motor controlled in the specified conditions.

1.05 SERVICE CONDITIONS

A. Reduced voltage motor controllers shall perform satisfactorily in the following service conditions without mechanical or electrical damage or degradation of operating characteristics:

1. Operating elevation of 470 feet above sea level.

2. Operating ambient temperature extremes of 23 to 104 degrees F.

3. Operating relative humidity: 0 to 95 percent, without condensation.

1.06 RECEIVING, STORING AND PROTECTING

A. Receive, store, and protect, and handle products according to NECA 1—*Standard Practices for Good Workmanship in Electrical Construction*.

1.07 EXTRA MATERIALS

A. Furnish six spares of each size and type fuse required.

1.08 PROJECT RECORD DOCUMENTS

A. Submit the following in accordance with Division 01770, Closeout Procedures and Division 01730, Operation and Maintenance Data:

1. Parameter Settings: For each motor controller provide a listing of all parameter settings that were changed from the manufacturer's default settings.

2. Test reports and certifications indicated in FIELD QUALITY CONTROL article.

PART 2 PRODUCTS

2.01 PRODUCT OPTIONS AND SUBSTITUTIONS

A. Manufacturer shall be Allen Bradley (Rockwell Automation). NO SUBSTITUTIONS.

2.02 REDUCED VOLTAGE MOTOR CONTROLLER

A. Provide UL508 listed and labeled reduced voltage (soft starter) motor controller as indicated on the Drawings and specified in this Division.

B. The soft starter shall be capable of operating a NEMA design B squirrel cage induction motor with a full load current equal to or less than the continuous output current rating of the soft starter.

C. The soft starter shall be microprocessor controlled and shall consist of a power section, logic board, and field wiring interface terminal board for ease of access to control and power wiring as well as maintenance requirements. The soft starter shall consist of the following general components:

1. Integral thermal sensor to trip and disengage the soft starter on heat sink over temperature.

2. Programmable keypad and alphanumerical LCD display that indicates present mode of operation. The LCD keypad shall display programming and diagnostic data in full text.

3. LED indicators to show the following: On, Start, Run, Soft Stop, Stop, Save/Slow Speed, Dual Set/Reverse, & Fault.

D. The soft starter input power section shall be designed to operate at, 460 Vac three phase input voltage.

E. The soft starter output power section shall be designed for three phase NEMA design B squirrel cage induction motor with amperage ratings from 5A through 1250A depending on actual configuration.

F. Include control power that is 120 Vac via a control power transformer. The transformer shall have 120-volt secondary and sufficient capacity to operate all connected cooling fans, pilot, indicating and control devices, plus 100 percent spare capacity. Provide fused primary and secondary. Bond un-fused leg of secondary to enclosure. Provide fuse blown indicating fuses.

G. The RVSS panel shall a Mag-Break motor circuit protector with a through-the-door handle interlocked to the enclosure door to provide a local and lockable means of removing all input power from the RVSS panel.

H. Branch circuit protection fuses shall be provided to protect the soft starter and bypass starter. Fuses shall be sized to provide proper branch circuit protection and be coordinated with other power circuit components.

I. The motor controller panel will include door mounted operator devices and keypad to facilitate programming, control functions and diagnostics.

J. The controller will include a line isolation contactor to remove three phase power from the starter and motor during stop and fault conditions.

K. An AC3 rated Bypass Starter with Class 10 motor overload relay will be included and controlled by the motor controller to allow cooler and more efficient operation during run conditions. This will also allow the control panel to run the motor using a full voltage, non-reversing starter in the event the reduced voltage motor controller trips.

L. Provide auxiliary control relays where required to accomplish interlocks and control sequences. Relays shall be heavy-duty general-purpose type, having 115 volt 60 Hertz operating coils.

M. Provide the controller with cooling air fan(s) and/or heat sink construction as required for maintaining the temperature of components within operating limits. Provide filtration for cooling air as required for the installation and operating environment.

N. Manufacturer: Allen-Bradley "SMC Flex Smart Motor Controller, NO SUBSTITUTIONS

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine surfaces to receive control equipment for compliance with installation tolerances and other conditions affecting performance of the control system. Do not proceed with installation until unsatisfactory conditions have been corrected.

B. Inspect for any physical damage

C. Verify that equipment is ready to install.

3.02 INSTALLATION

A. Install motor controller indicated on the Drawings and according to manufacturer's instructions. Manufacturer's installation instructions shall be available at the construction site.

B. Mount with digital display panel 5'-0" above floor or as indicated on the Drawings.

C. Install enclosed controllers plumb. Provide supports in accordance with the requirements of Section 16050, *Basic Electrical Materials and Methods*. and the NEC.

D. Ground and bond motor controllers and control devices as required in Section 16050, *Basic Electrical Materials and Methods*.

E. Identify motor controllers and install warning signs as required in Section 16050, *Basic Electrical Materials and Methods*.

F. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. Where manufacturer's torque values are not furnished, use those specified in UL Standard 486A-486B.

G. Set overload relays or install overload heater elements in motor controllers to match installed motor characteristics.

H. Provide neatly typed label inside each motor starter enclosure door identifying motor served, nameplate horsepower, full load amperes, code letter, service factor, and voltage/phase rating. Place label in clear plastic holder.

3.03 FIELD QUALITY CONTROL

A. Clean, inspect, test, adjust, and energize motor controllers in accordance with the manufacturer's instructions.

1. Inspect each controller for physical damage, proper alignment, and proper anchorage.

2. Configure motor controller parameters to match requirements of the served system.

3. Keep records of inspections, tests, configurations, and adjustments for each controller; submit them to the Resident Engineer.

B. After completing installation, cleaning, and testing, touch-up scratches and mars on finish to match original finish.

3.04 MANUFACTURER'S FIELD SERVICE

A. Provide the services of a factory trained representative from the manufacturer to inspect and certify the installation and to oversee energizing and testing.

B. Manufacturer's representative shall certify in writing that each controller has been installed, adjusted, and tested in accordance with the manufacturer's recommendations.

C. Provide one full work day of training for up to three City representatives at the project site. A manufacturer's qualified representative shall conduct training session. The training program shall consist of instruction on the operation and maintenance of the reduce voltage soft start motor controllers.

END OF SECTION

SECTION 16421
SURGE ARRESTORS

PART 1 -- GENERAL

1.1 WORK OF THIS SECTION

A. The Contractor shall provide surge arrestors for the protection of electrical power equipment against surges caused by lightning or switching, complete and operable, in accordance with the Contract Documents.

1.2 RELATED SECTIONS

A. The Work of the following Sections applies to the Work of this Section. Other Sections, not referenced below, shall also apply to the extent required for proper performance of this Work.

1. Section 16050 Basic Electrical Materials and Methods
2. Section 16400 Low Voltage Electrical Service and Distribution

1.3 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

A. Except as otherwise indicated, the current editions of the following apply to the Work of this Section:

1.	ANSI C 62.1	Surge Arrestors for AC Power Circuits
2.	NEMA LA 1	Surge Arrestors
3.	UL 1449	Clamp Voltage Documentation
4.	NFPA 70	National Electrical Code

1.4 CONTRACTOR SUBMITTALS

A. Shop Drawings: The Contractor shall submit shop drawings and catalog data in accordance with Section 01300 - Submittals.

1. Catalog literature for arrestors proposed for installation; submittal shall identify materials, ratings, loss, dimensions.

2. Shop drawings showing arrestor mounting.

3. Certified test data and individual test data for arrestors.

4. Operation and maintenance data.

PART 2 -- PRODUCTS

2.1 GENERAL

A. Secondary Service Suppressors for Low Voltage Panels:

1. Surge protective devices shall be installed at designated panels indicated on the single line diagrams.

2. Wye systems shall have suppression elements between each phase conductor and the system neutral, between each phase conductor and the system ground and between the neutral conductor and ground.

3. Visible indication of proper suppressor connection and operation shall be provided.

4. The surge protective device shall be equipped with an audible alarm that shall actuate when any part of the surge circuitry has been damaged. A silence button shall be provided with the alarm.

5. The suppressor shall exhibit Sine Wave Tracking circuitry. The surge suppressor shall have suppression circuitry that is field replaceable without disturbing the conduit or enclosure.

6. Suppressors shall meet or exceed the following:

   a. Minimum single impulse current rating (L-N + L-G): 80,000 A per phase.

   b. UL clamping voltage shall not exceed the following:

Voltage	L-N	L-G	N-G
120/208	400V	400V	400V
277/480	800V	800V	800V

7. Suppressors shall consist of solid-state components and operate bi-directionally. The manufacturer of the surge panel shall offer either a surface or flush cover, as required by the job conditions.

8. Maximum continuous operating voltage of the suppressor shall be greater than 110% of the nominal system voltage.

9. Manufacturers, or equal

a. EFI Electronics Corporation, Titan BP Series.
b. Phoenix Contact, Trabtech.
c. Current Technology, DPA Series.
d. MCG Surge Protection

2.2 MOUNTING

A. The manufacturer shall provide all the necessary mounting hardware.

2.3 FACTORY TESTS

A. The manufacturer shall provide copies of design test data on the arrestor provided showing that the arrestors are in compliance with ANSI C62.1-Surge Arrestors for AC Power Circuits.

B. The following tests shall be made on each arrestor intended for the service entrance in conformance with ANSI 62.1:

1. Power-frequency spark-over.
2. Radio influence voltage.
3. Sealing.

C. The design test data and the individual arrestor test results shall be certified and submitted.

2.4 WARRANTY

A. The surge arrestor/suppressor manufacturer shall warrant the surge protective devices and supporting components, against defects in material and workmanship for a period of 5 years. The warranty shall include cost of component replacement, labor, travel and living expenses, all at no increased cost to the City.

PART 3 -- EXECUTION

3.1 SERVICE ENTRANCE

A. The Contractor shall install one primary suppressor at each utility service entrance or as indicated on the single line diagram. Installation shall be performed in accordance with the manufacturer's installation instructions.

B. The suppressor shall be installed within the Switchboard.

C. Conductors between the suppressor and point of attachment shall be at least #6 AWG stranded copper conductor or larger. The conductors shall be kept as short and straight as possible. The lead length of connecting conductors shall be within 36 inches.

D. The suppressor's ground shall be bonded to the service entrance ground.

END OF SECTION

SECTION 16441
SWITCHBOARDS

PART 1 GENERAL

1.1 SECTION INCLUDES

Section covers floor-mounted deadfront low-voltage switchboards which consist of an enclosure, circuit breakers, instruments and metering equipment, monitoring equipment or control equipment, with associated interconnections and supporting structures. Uses on Project include:

1. Main Switchboard - Furnish and install the service entrance switchboard(s) shown on the Drawings and specified in this Section.

1.2 SUBMITTALS

Submit the following in accordance with Section 01300– *Submittals*:

1. Calculations: Submit coordination study for switchboard prepared in accordance with IEEE Std 242 – *Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems*; demonstrate fully selective coordination within switchboard and with immediate upstream and downstream overcurrent protective devices.

2. Catalog Data: Submit catalog data describing each type switchboard, circuit breaker, accessory item, and component specified. Include data substantiating that materials comply with specified requirements.

3. Certification: Submit certification and backup information that switchboard can perform required functions after a design earthquake as specified in "SERVICE CONDITIONS" below.

    a. Switchboards designated with I_p greater than 1.0 shall be certified by the manufacturer to withstand the total lateral seismic force and seismic relative displacements specified in the *International Building Code* (IBC) or ASCE 7 – *Minimum Design Loads for Buildings and Other Structures*.

    b. Certification shall be based on shake table testing or experience data (i.e., historical data demonstrating acceptable seismic performance), or by more rigorous analysis providing for equivalent safety.

    c. Required response spectra shall exceed 1.1 times the in-structure spectra determined in accordance with IBC AC156 – *Acceptance Criteria for Seismic Qualification by Shake-Table Testing of Nonstructural Components and Systems*.

4. Certification: Submit certification by manufacturer's field technical representative that the subcontractor has installed, adjusted, and tested the switchboard according to the manufacturer's recommendations.

5. Installation Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency specified under Quality Assurance.

Include instructions for storage, handling, protection, examination, installation, and starting of Product.

6. Operation and Maintenance Instructions: Submit operation and maintenance instructions including step-by-step inspection and maintenance test procedures and a listing of recommended spare parts. Include instructions for testing circuit breakers.

7. Performance Data/Curves: Submit time-current curves for each circuit breaker.

8. Shop Drawings: Submit shop drawings for each switchboard including dimensioned plans and elevations and component lists. Include front and side views of enclosure showing overall dimensions, enclosure type, enclosure finish, unit locations, and conduit entrances. Include the following:

    a. Front, side, and plan view of the switchboards.

    b. Single line or three line diagrams.

    c. Nameplate schedule.

    d. Component lists.

    e. Conduit entry locations.

    f. Busway entry locations and details.

    g. Switchboard ratings including short circuit, voltage, and current.

    h. Major component ratings including voltage, current, and interrupting.

    i. Cable terminal sizes and types.

    j. Shipping splits.

    k. Enclosure type with details for types other than NEMA Type 1.

    l. Bus configuration and current ratings.

    m. Features, characteristics, ratings, and factory settings of individual protective devices and auxiliary components.

    n. Key interlock scheme drawing and sequence of operations.

9. Test Reports: Submit results of factory production tests specified in NEMA PB 2 and field inspections and tests required by this Section.

10. Warranty: Letter indicating that manufacturer will issue a one year commercial warranty against defects in material or workmanship when the City has received inspected and accepted the equipment.

11. Wiring Diagrams: Submit detailed schematic wiring diagrams including device identifications and numbered terminals for power, control, communications

and instrumentation systems, and differentiating between manufacturer-installed and field-installed wiring.

1.3 DEFINITIONS

Unless otherwise specified or indicated, electrical and electronics terms used in this Section are as defined in IEEE Std 100 – *The Authoritative Dictionary of IEEE Standards Terms.*

1.4 QUALITY ASSURANCE

Comply with the *National Electrical Code* (NEC) for components and installation.

Provide products that are listed and labeled by a Nationally Recognized Testing Laboratory (NRTL) for the application, installation condition, and the environment in which installed.

Comply with IEEE C37.13 – *Standard for Low-voltage AC Power Circuit Breakers Used in Enclosures* and IEEE C37.17 – *Standard for Trip Devices for AC and General Purpose DC Low-voltage Power Circuit Breakers.*

Comply with NEMA PB 2 – *Deadfront Distribution Switchboards,* and NEMA AB 3 – *Molded Case Circuit Breakers and their Application*

Comply with UL 891 – *Switchboards*, UL 489 – *Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker Enclosures,* UL 1066 – *Low-Voltage AC and DC Power Circuit Breakers Used in Enclosures,* UL 486A-486B – *Wire Connectors,* UL 1581 – *Reference Standard for Electrical Wires, Cable, and Flexible Cords.*

Provide switchboard(s) manufactured in a certified ISO 9001 or 9002 facility.

1.5 SCHEDULING

Coordinate and schedule installation of the low-voltage switchgear with Resident Engineer.

Schedule work on weekends and holidays to reduce interruption of User operations.

Coordinate switching of 15kV circuits with the SDG&E.

1.6 RECEIVING, STORING AND PROTECTING

Receive, inspect, handle, and store switchboard(s) according to the following:

1. Manufacturer's written instructions.
2. NECA 1 – Standard Practices for Good Workmanship in Electrical Construction (ANSI) and NECA 400 – Recommended Practice for Installing and Maintaining Switchboards (ANSI).
3. NEMA PB 2.1 – Proper Handling, Installation, Operation and Maintenance of Deadfront Switchboards Rated 600 Volts or Less.

Perform receipt inspection of switchboard molded-case circuit breakers. Examine each switchboard molded-case circuit breaker to verify that it is genuine, new, and unaltered. Report any suspect/counterfeit circuit breakers to San Diego Water Department. Indicators of suspect/counterfeit molded-case circuit breakers include the following:

1. Missing date code.
2. Date code is older than two years, or style is no longer manufactured.
3. Factory seals broken or removed.
4. Mislabeled or over-labeled to change size or type.
5. Non-English text in labels.
6. Missing or suspect UL sticker; CE is not an acceptable NRTL.
7. Low quality labeling and/or misspelled words on labels.
8. Outdated manufacturer's label or logo, or refurbisher's name on label.
9. Not received in original, sealed packaging.
10. Screwdriver or wrench marks on terminals.
11. Handle modified to change ampere rating.
12. Contradicting amperage, voltage, or interrupting ratings.

1.7 EXTRA MATERIALS

Provide one spray can of touch-up paint that matches switchboard finish.

Furnish any special tools or test equipment required to operate and maintain the equipment.

Furnish a total of three (3) of each size and type power and control fuse installed in the switchboard.

1.8 SERVICE CONDITIONS

Provide switchboards and accessories that will perform satisfactorily in the following service conditions without mechanical or electrical damage or degradation of operating characteristics:

1. Elevation of 470 feet above sea level.
2. Maximum ambient temperature of extremes of 32 to 104 °F.
3. 24-hour average temperature not exceeding 86 °F.
4. Operating relative humidity: 0 to 95 percent, without condensation.
5. Load current harmonic factor not exceeding 5% THD.

6. International Building Code seismic criteria:

   a. Seismic Design Category = Zone 4

   b. S_{DS} = spectral acceleration, short period = 0.75g

   c. S_{D1} = spectral acceleration, 1-second period = 0.64g

   d. a_p = component amplification factor = 2.5

   e. R_p = component response modification factor = 6.0

   f. Ip = Component importance factor
   I_p = 1.5 for life safety related components such as emergency system switchboards
   I_p = 1.5 for safety class or safety significant system switchboards.
   I_p = 1.0 for all other switchboard applications

Conform to NEMA PB 2 service conditions during and after installation of switchboards.

1.9 FIELD MEASUREMENTS

Verify field measurements against manufacturer's shop drawings prior to fabrication.

PART 2 PRODUCTS

2.1 PRODUCT OPTIONS AND SUBSTITUTIONS

Alternate products may be accepted; follow requirements of *Standard Specifications for Public Works Construction* ("Whitebook"), 2015 edition.

2.2 SWITCHBOARD GENERAL REQUIREMENTS

Provide NRTL-listed enclosed switchboard that is designed and fabricated in accordance with NEMA PB 2 and has electrical ratings and configurations as indicated on Drawings or specified in this Section.

Switchboards having a main circuit breaker shall be NRTL-listed for use as service entrance equipment.

Provide switchboard having NRTL-listed short circuit current rating not less than the available fault current indicated on the Drawings.

Provide compression lugs for service, feeder, and branch circuit cable connections greater than 100 amperes; provide mechanical lugs for connections 100 amperes or less.

2.3 SWITCHBOARD ENCLOSURE

Provide switchboard with NEMA Type 1 general enclosure as indicated on the Drawings or as required by the installation location.

1. Section alignment:

a. Switchboards with front accessible load connections shall have sections rear aligned.

2. Provide removable steel base channels (1.5 inch floor sills) bolted to the frame to rigidly support the entire shipping section for moving on rollers and floor mounting.

3. Enclosure shall be painted on all surfaces with manufacturer's standard medium gray, applied by electro-deposition over an iron phosphate pre-treatment.

4. Front covers shall be screw removable with a single tool and doors shall be hinged with removable hinge pins.

2.4 SWITCHBOARD BUSSING

Provide switchboard with copper phase [and neutral] bus.

1. Provide full-rated, non-tapered switchboard through bus.

2. For 4-wire systems, the neutral bus shall be of equivalent ampacity as the phase bus bar unless otherwise indicated on the Drawings.

3. Switchboard bus current ratings shall be determined by heat-rise tests conducted according to UL 891.

4. Switchboards used on 480V and 480Y/277V systems shall have bus insulators and separations rated for 600V.

5. Bus connection areas shall be silver-plated.

6. All bus joints shall consist of Grade 5 hardware and Bellville washers.

7. All bolted bus connections shall be accessible for maintenance after switchboard is installed.

8. Make full provisions for the addition of future sections; include all necessary hardware to accommodate splicing for future additions.

Provide copper equipment ground that extends through each switchboard section

1. Size ground bar per NEC and UL 891 but not smaller than required for mounting IEEE 837 2-hole compression lugs.

2. Provide bolt holes in NEMA 1.75-inch pattern to accept 2-hole compression lugs.

3. Bond ground bus to each switchboard section.

4. Make full provisions for the addition of future switchboard sections; include all necessary hardware to accommodate splicing for future additions.

2.5 SWITCHBOARD METERING

Provide electronic meter, instrument transformers, test switches and plugs, and fuses specified in Section 16400 *Low Voltage Electrical Service and Distribution* in a dedicated, barriered instrument compartment.

1. Mount top of meter readout approximately 60 inches above the bottom of the switchboard.
2. Furnish NEMA PB 2 utility transformer compartment for current transformers specified in Section 16400 *Low Voltage Electrical Service and Distribution.*
3. Provide current transformers appropriately sized for use on the main.
4. Provide potential transformers if required by the meter.

2.6 SWITCHBOARD CIRCUIT BREAKERS

Provide circuit breakers as indicated on the Drawings and specified in this Section.

1. Provide NRTL-listed circuit breakers of the type, rating, and features as indicated on the Drawings.
2. Provide 600 V rated 2-pole and 3-pole circuit breakers on 480 V or 480Y/277 V systems.
3. Provide permanently-installed handle lock-off device that will accept a padlock for each circuit breaker.
4. Fully equip all unused circuit breaker spaces for future devices, including all appropriate connectors and mounting hardware.

Main circuit breaker

1. Provide fixed-mounted molded-case main circuit breaker if circuit breaker weight is less than 42 lb.
    a. Circuit breaker shall comply with NEMA AB 3.
    b. If ground-fault protection or zone-selective interlocking is required, provide electronic trip unit as described below.
    c. If ground-fault protection or zone-selective interlocking is not required, provide circuit breaker with thermal-magnetic trip unit having an adjustable instantaneous trip.
2. Provide draw-out mounted main circuit breaker if circuit breaker weight is equal to or greater than 42 lb.
    a. Provide molded-case or insulated case circuit breaker that complies with NEMA AB 3, or power circuit breaker that complies with IEEE C37.13.
    b. Provide electronic trip unit as described below.

Feeder and branch circuit breakers:

1. Provide fixed-mounted molded-case feeder and branch circuit breakers.
    a. Circuit breakers shall comply with NEMA AB 3.
    b. If ground-fault protection or zone-selective interlocking is not required, provide circuit breakers with thermal-magnetic trip unit having an adjustable instantaneous trip.
    c. If ground-fault protection or zone-selective interlocking is required, provide circuit breakers with electronic trip unit as described below.
    d. Load connections shall be front-accessible.

Electronic trip units:

1. Provide NRTL-listed circuit breaker electronic trip units conforming to ANSI C37.17-1997 *Trip Devices for AC and General Purpose DC Low Voltage Power Circuit Breakers.*
2. Provide field interchangeable rating plug.
3. Trip unit shall have adjustable functions as follows:
    a. Long-time pickup and delay
    b. Short-time pickup and delay
    c. Instantaneous pickup with OFF position
    d. Ground fault pickup and delay.
4. Provide zone selective interlocking for each electronic trip unit. Implement zone selective interlocking between main and feeder circuit breakers within the switchboard with electronic trip units. Interlock both short-time and ground-fault time delays with upstream and downstream trip units so the circuit breaker closest to a fault will trip with no delay.
5. Trip unit shall use true RMS current sensing.
6. The following trip indications shall be visible on the front of the trip unit:
    a. Long-time
    b. Short-time or instantaneous
    c. Ground fault
7. Provide a removable and sealable transparent cover for trip unit adjustments and rating plug to comply with NEC requirements.
8. Provide neutral conductor current transformers if required for ground-fault protection.

2.7 SURGE PROTECTION

Provide Surge arresters connected to the line-side of the main circuit breaker; refer to Section 16421 –*Surge Arrestors.*

Provide transient voltage surge suppressors connected to the main bus on the load side of the main circuit breaker; refer to Section 16421 –*Surge Arrestors.*

2.8 IDENTIFICATION

Provide engraved laminated Category I nameplate for each device. Refer to Section 16050, *Basic Electrical Materials and Methods.*

Show the entire single line switchboard bus work, as depicted on the factory record drawing, on an engraved nameplate. The nameplate plate shall be located at eye level on the front cover of the switchboard incoming service section.

2.9 CONTROL WIRING

Use Type SIS flexible stranded 90 °C wire that is VW-1 flame test rated per UL 1581 for control and communications wiring.

Secure wires in bundles using nylon ties; anchor bundles to the switchgear assembly using pre-punched wire lances.

Connect current transformer secondary leads to accessible short-circuiting terminal blocks before connecting to any other device.

Terminate control and communications conductors on terminal blocks with suitable numbering strips; use crimp-on solderless lugs.

Provide wire markers at each end of all control and communications wiring.

2.10 SWITCHBOARD ACCESSORIES

Provide the following accessories, modifications, or special features for switchboards as indicated on the Drawings or as required.

Provide transformers with 220 degrees F insulation and primary plus secondary fuses to provide 120 volt control power as required by: metering and monitoring system;. Provide transformers rated for not less than 125 percent of the connected equipment load. Provide fuses with blown-fuse indicators while fuse is installed in the fuse mounting.]

Provide neutral bus rated 200% of the phase bus for high harmonic applications.

2.11 SWITCHBOARD MANUFACTURERS

Eaton: "Pow-R-Line C" (front connected)

Siemens: "Sentron" (front connected.

Square D: "QED-2" (front connected).

PART 3 EXECUTION

3.1 EXAMINATION

Examine surfaces to receive switchboard(s) for compliance with installation tolerances and other conditions affecting performance of the product. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

Install switchboard(s) where indicated on the Drawings and according to manufacturer's instructions, NECA 407, and the *NEC*. Have the manufacturer's installation instructions available at the construction site.

Provide a minimum of 1/2 inch space between the back of switchboard and a wall; provide a minimum of 6 inch space for damp locations.

Install switchboard on a reinforced concrete housekeeping pad. Refer to Section 16050, *Basic Electrical Materials and Methods*.

Remove temporary lifting eyes, channels, brackets, and temporary blocking of moving parts from switchboard enclosure and components.

Ground and bond switchboards as required in Section 16 050 – *Basic Electrical Materials and Methods*.

Install conduits as required in 16 050 – *Basic Electrical Materials and Methods*.

1. Terminate conduits in the switchboard section containing the corresponding device.
2. Install plugged couplings set flush with the top of the concrete pad. After switchboard is set in place, extend conduits to 1-1/4 inch above the pad and terminate with insulated grounding bushings.

Install conductors as required in Section 16050, *Basic Electrical Materials and Methods*.

1. Train conductors neatly in groups; bundle and secure as recommended by manufacturer to withstand fault current.
2. Use compression type lugs to connect all service, feeder, and branch circuit cables greater than 100 amperes.
3. Tighten electrical connectors and terminals, including bus bar and grounding connections, according to the manufacturer's published torque-tightening values. Where manufacturer's torque values are not indicated, use those specified in UL 486A-486B.

3.3 IDENTIFICATION

Identify switchboard and install warning signs and arc-flash warning labels as required in Section 16050, *Basic Electrical Materials and Methods*.

Provide nameplate for overcurrent protective device. Refer to Section Section 16050, *Basic Electrical Materials and Methods*.

At indoor locations, mark floor in front of switchboard to show NEC required working clearances according to Section 16050, *Basic Electrical Materials and Methods*.

Post one-line diagrams data and operating instructions in accordance with Section 16050, *Basic Electrical Materials and Methods*.

3.4 FIELD QUALITY CONTROL

Clean, inspect, test, and energize switchboards in accordance with NECA 407.

Verify that circuit breakers are in the proper locations and that setting of solid state trip devices and current sensor taps match values scheduled on the Drawings.

Exercise each circuit breaker three times to verify smooth mechanical operation.

Verify proper torque of accessible bus connections and mechanical fasteners after installing switchboard.

Coordinate inspections and tests with those required by Section 16950 – *Electrical Tests*.

After completing installation, cleaning, and testing, touch up scratches and mars on finish to match original finish.

3.5 MANUFACTURER'S FIELD SERVICE:

Provide the services of a factory trained representative from the manufacturer to inspect and certify the installation and to oversee energizing and testing.

Manufacturer's representative shall certify in writing that the equipment has been installed, adjusted, and tested in accordance with the manufacturer's recommendations.

Provide one full work day of training for up to three City representatives at the project site. A manufacturer's qualified representative shall conduct training session. The training program shall consist of instruction on the operation and maintenance of the switchboard, circuit breakers, and major components.

END OF SECTION

SECTION 16442
PANELBOARDS

PART 1 GENERAL

1.1 SECTION INCLUDES

Panelboards for feeder and branch circuit loads.

1.2 SUBMITTALS

Submit the following in accordance with Section 01300, Submittals:

1. Catalog Data: Submit catalog data describing each type panelboard, accessory item, and component specified. Include data substantiating that materials comply with specified requirements.

2. Certification: Submit certification and backup information that panelboard can perform required functions after a design earthquake as specified in "SERVICE CONDITIONS" below.

    a. Panelboards designated with I_p greater than 1.0 shall be certified by the manufacturer to withstand the total lateral seismic force and seismic relative displacements specified in the *International Building Code* (IBC) or ASCE 7 – *Minimum Design Loads for Buildings and Other Structures.*

    b. Manufacturer's certification shall be based on shake table testing or experience data (ie, historical data demonstrating acceptable seismic performance), or by more rigorous analysis providing for equivalent safety.

    c. Required response spectra shall exceed 1.1 times the in-structure spectra determined in accordance with IBC AC156 – *Acceptance Criteria for Seismic Qualification by Shake-Table Testing of Nonstructural Components and Systems.*

3. Shop Drawings: Submit shop drawings for each panelboard including dimensioned plans and elevations and component lists. Include front and side views of enclosure showing overall dimensions, enclosure type, enclosure finish, unit locations, and conduit entrances. Include the following:

    a. Enclosure type with details for types other than NEMA Type 1.

    b. Bus configuration and current ratings.

    c. Short-circuit current rating of panelboard.

    d. Features, characteristics, ratings, and factory settings of individual protective devices and auxiliary components.

4. Wiring Diagrams: Submit detailing schematic wiring diagrams including control wiring, and differentiating between manufacturer-installed and field-installed wiring.

5. Installation Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency specified under Quality Assurance. Include instructions for storage, handling, protection, examination, installation, and starting of Product.

6. Operation and Maintenance Instructions: Submit operation and maintenance instructions. Include instructions for testing circuit breakers.

1.3 QUALITY ASSURANCE

Comply with the *National Electrical Code* (NEC) for components and installation.

Furnish products that are listed and labeled by a Nationally Recognized Testing Laboratory (NRTL) for the application, installation condition, and the environment in which installed.

Comply with NEMA PB 1 *Panelboards*, NEMA PB 1.1 *General Instructions for Proper Installation, Operation, and Maintenance of Panelboards Rated 600 Volts or Less,* and NEMA AB 3 *Molded Case Circuit Breakers and Their Application.*

Comply with UL 67 *Panelboards*, UL 50 *Enclosures for Electrical Equipment*, and UL 489 *Molded Case Circuit Breakers.*

The manufacturer of the panelboards shall have an ISO 9001 certified quality management system.

Furnish products suitable for operation at 470 ft. altitude.

1.4 RECEIVING, STORING AND PROTECTING

Receive, inspect, handle, and store panelboards according to NECA 1 *Standard Practices for Good Workmanship in Electrical Construction* (ANSI) and NECA 407 *Recommended Practice for Installing and Maintaining Panelboards* (ANSI).

1.5 EXTRA MATERIALS

Furnish six spare keys of each type for panelboard cabinet locks.

Furnish one spray can of touch-up paint that matches panelboard finish.

1.6 SERVICE CONDITIONS

Provide panelboards and accessories that will perform satisfactorily in the following service conditions:

1. Elevation of 470 feet above sea level.
2. Maximum ambient temperature of 94 °F.
3. 24-hour average temperature not exceeding 86 °F.
    a. Load current harmonic factor not exceeding 5% THD.

Conform to NEMA PB1 service conditions during and after installation of panelboards.

PART 2 PRODUCTS

2.1 PRODUCT OPTIONS AND SUBSTITUTIONS

Alternate products may be accepted; follow requirements of *Standard Specifications for Public Works Construction* ("Whitebook"), 2015 edition.

2.2 PANELBOARDS

Furnish panelboards as indicated on the Drawings and specified in this Section.

Panelboards shall be UL67 listed and shall conform to NEMA PB1.

Main bus rating for the panelboards described in this Section shall not exceed 1200 amperes and main circuit breaker frame size shall not exceed 800 amperes. Refer to Section 16441, Switchboards, when main bus rating exceeds 1200 amperes or main circuit breaker frame size exceeds 800 amperes.

Where practical combine adjacent panelboards into integrated assemblies of 90-inch high modular components.

Furnish panelboard cabinets for flush or surface mounted as indicted on the Drawings.

1. Furnish NEMA Type 1 enclosures.
2. Cabinets shall be not less than 20 inches wide.
3. Furnish galvanized steel cabinets constructed according to UL 50 requirements.
4. NEMA 1 boxes shall have removable end walls.

Furnish trim fronts that meet the strength and rigidity requirements of UL 50.

1. Each panelboard trim front shall include a door.
2. Fronts for surface-mounted panels shall be same dimensions as box.
3. Fronts for flush panels shall overlap boxes at least 1 inch.
4. Fronts shall have ANSI 49 medium gray enamel electro-deposited over cleaned, phosphatized steel.
5. For NEMA 1 panelboards, furnish fronts with hinged door-in-door trim construction. The front shall contain a smaller lockable door, which when open, shall provide access to all device handles and rating labels. The hinged front, when open, shall provide access to all conductors and wiring terminals. The panelboard door shall open by a single lockable latch; the entire hinged front trim shall open by removing screws.
6. Furnish a panelboard circuit directory card in a metal frame mounted inside the panelboard door. The directory card shall include spaces for circuit numbers and sufficient spaces to allow each circuit to be described in sufficient detail to be distinguished from all others.

7. Furnish cylindrical tumbler type locks for doors. Furnish sliding vault locks with 3-point latching for enclosures more than 48 inches high. Key all lock assemblies alike. Furnish two (2) keys with each lock plus spares as required in the Extra Materials paragraph above.

Panelboard phase and neutral bus shall be copper. Panelboard bus current ratings shall be determined by heat-rise tests conducted according to UL 67. Panelboards used on 480V and 480Y/277V systems shall have bus insulators and separations rated for 600V.

Furnish panelboard box with dimensions as required to accommodate compression lugs on cables for the panelboard mains, neutral bar, and circuit breakers rated 100 amperes and larger. Refer to Section 16050, *Basic Electrical Materials and Methods* for compression lug requirements.

Furnish copper equipment ground bus that is adequate for feeder and branch circuit equipment ground conductors. Bond ground bus to cabinet.

Panelboards having a main circuit breaker shall be NRTL-listed for use as service entrance equipment.

Equip panelboards with mounting brackets, bus connections, and necessary appurtenances, for the future installation of circuit breakers in the "spaces" scheduled on the Drawings.

Furnish panelboards having NRTL-listed short circuit current ratings not less than the available fault current indicated on the Drawings. With the exception of panelboard with a current-limiting main circuit breaker, do not use "series ratings" for circuit breaker interrupting capacities. The short circuit rating for a panelboard without a current-limiting main circuit breaker shall not exceed the lowest interrupting capacity rating of any circuit breaker installed in the panelboard.

Furnish thermal-magnetic circuit breakers that meet the requirements of UL 489 and NEMA AB 3.

1. Furnish circuit breakers of the type, rating, and features as indicated on the Drawings.

2. Furnish 600V-rated two-pole and three-pole circuit breakers for 480V or 480Y/277V systems.

3. Furnish circuit breakers with the following minimum NRTL-listed interrupting capacities:

    a. 208Y/120V and 120/240V applications: 10,000 amperes, RMS symmetrical

    b. 480V and 480Y/277V applications: 14,000 amperes, RMS symmetrical.

4. Furnish field adjustable instantaneous trip setting for circuit breakers with frame size greater than 100 amperes.

5. Do not use tandem circuit breakers.

6. Furnish multi-pole breakers with a common trip.

7. Furnish bolt-on type circuit breakers or circuit breakers that connect to the panel bus through positive gripping connector jaws and are secured by an independent mechanical locking device.

8. Single-pole, 15 and 20 ampere circuit breakers intended to switch fluorescent lighting loads on a regular basis shall have the SWD marking.

9. Circuit breakers intended to switch high intensity discharge lighting loads on a regular basis shall have the HID marking.

10. Furnish UL Class A ground fault interrupter circuit breakers where scheduled on Drawings.

11. Furnish circuit breakers with provisions for connecting the size and number of conductors indicated on the Drawings. Refer to Section 16050, *Basic Electrical Materials and Methods* for conductor connection requirements.

Furnish a permanently-installed handle lock-off device for each circuit breaker.

1. Furnish handle lock-off device that will accept a 1/4-inch padlock shackle.

2. Securely attach the device to the circuit breaker case; the attachment shall not depending on a friction fit or the presence of the panelboard front for the handle lock-off device to remain in place and be functional.

Manufacturers:

1. Eaton:

   a. 480 V and 480Y/277 V: "PRL3a" and "PRL4"

   b. 208Y/120 V and 120/240 V: "PRL1a" and "PRL2a"

2. Siemens:

   a. 480 V and 480Y/277 V: "P2", "P3", and "P4"

   b. 208Y/120 V and 120/240 V: "P1"

3. Square D:

   a. 480 V and 480Y/277 V: "NF" and "I-LINE"

   b. 208Y/120 V and 120/240 V: "NQ" and "I-Line"

PART 3 EXECUTION

3.3 EXAMINATION

Examine surfaces to receive panelboards for compliance with installation tolerances and other conditions affecting performance of the control system. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.4 INSTALLATION

Install panelboards where indicated on the Drawings and according to manufacturer's instructions, NEMA PB 1.1, NECA 407, and the *NEC*. Have the manufacturer's installation instructions available at the construction site.

Furnish supports in accordance with the requirements of Section 16070 Hangers, Supports and Seismic Protection.

Position panelboards so the top circuit breaker handle is not more than 6'-7" above the surface of the working space in front of the panelboard.

Ground and bond panelboards as required in Section 16050, *Basic Electrical Materials and Methods*.

3.5 IDENTIFICATION

Furnish typed circuit directories for each branch circuit panelboard. Revise directories to reflect circuiting changes required to balance phase loads.

1. Furnish one hard copy and an electronic copy of the panelboard schedule to the Facility Manager at project closeout.
2. Install a plastic-laminated copy of the circuit directory on the inner side of the panelboard door.

Identify panelboards and install warning signs and arc-flash warning labels as required in Section 16050, *Basic Electrical Materials and Methods*.

3.6 FIELD QUALITY CONTROL

Clean, inspect, test, and energize panelboards in accordance with NECA 407. Exercise each circuit breaker three times to verify smooth mechanical operation.

Coordinate inspections and tests with those required by Section 16950, Electrical Tests.

After completing installation, cleaning, and testing, touch-up scratches and mars on finish to match original finish.

3.7 LOAD BALANCING

After Substantial Completion, but not more than two months after Final Acceptance, conduct load-balancing in accordance with NECA 407 and as follows:

1. Do measurements during period of normal working loads as advised by the User.
2. Make load-balancing circuit changes outside the normal occupancy/working schedule of the facility. Arrange with User to avoid disrupting critical services.
3. Recheck loads after circuit changes during a normal load period. Record all load readings before and after changes and submit test records.

END OF SECTION

SECTION 16461
DRY TYPE TRANSFORMERS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Dry-type resin encapsulated distribution transformers with primary and secondary voltages of 600V and less and capacity ratings through 225kVA.

1.2 QUALITY ASSURANCE

A. Comply with the *National Electrical Code* (NEC) for components and installation.

B. Provide products that are listed and labeled by a Nationally Recognized Testing Laboratory (NRTL) for the application, installation condition, and the environment in which installed.

C. The manufacturer of the transformers shall be a certified ISO 9001 facility.

D. Provide products that comply with the following industry standards:

1. NEMA TP 1 – *Guide for Determining Energy Efficiency for Distribution Transformers*,
2. NEMA TP 2 – *Standard Test Method for Measuring the Energy Consumption of Distribution Transformers.*
3. NEMA TP 3 – *Standard for the Labeling of Distribution Transformer Efficiency.*
4. UL 1561 – *Dry-Type General Purpose and Power Transformers*

1.3 SUBMITTALS

A. Submit the following in accordance with Section 01300 Submittals.

B. Catalog Data. Include outline and support point dimensions of transformer enclosures and accessories, unit weight, voltages, kVA, impedance, NEMA TP 1 efficiency, sound level, tap configurations, insulation system type, and rated temperature rise.

C. Operation and maintenance instructions.

1.4 SERVICE CONDITIONS

A. Provide transformers and accessories that will perform satisfactorily in the following service conditions:

1. Maximum ambient temperature of 104 °F.
2. 24-hour average temperature not exceeding 86 °F.
3. Load current harmonic factor not exceeding 5% THD.

1.5 RECEIVING, STORING AND PROTECTING

A. Receive, store, and protect, and handle products according to NECA 1 – *Standard Practices for Good Workmanship in Electrical Construction* and NECA 409 – *Recommended Practice for Installing and Maintaining Dry-Type Transformers* (ANSI).

PART 2 PRODUCTS

2.1 PRODUCT OPTIONS AND SUBSTITUTIONS

A. Alternate products may be accepted; follow requirements of *Standard Specifications for Public Works Construction* ("Whitebook"), 2015 edition.

2.2 GENERAL

A. Transformers shall be NRTL listed to UL 1561 and shall be tested and labeled according to NEMA ST20

B. All insulating materials are to exceed NEMA ST20 standards and be rated for 180°C UL component recognized insulation system.

C. All cores to be constructed of high grade, non-aging silicon steel with high magnetic permeability and low hysteresis and eddy current losses. Magnetic flux densities are to be kept well below the saturation point.

D. Transformers shall be 115°C temperature rise above 40°C ambient. Exact voltages and taps to be as designated on the plans or the transformer schedule.

E. The maximum temperature of the top of the enclosure shall not exceed 65°C rise above a 40°C ambient.

F. The transformer(s) shall be rated as indicated in the following schedule:

Identification Number(s)
kVA Rating
Voltages
Phase
Frequency

G. Terminations whall consist of wire leads with minimum insulation rating of 125 °C.

H. The transformer enclosures shall be non-ventilated and be fabricated of heavy gauge, sheet steel construction. The entire enclosure shall be finished utilizing a continuous process consisting of degreasing, cleaning and phosphatizing by electrostatic deposition of polymer polyester powder coating and baking cycle to provide uniform coating of all edges and surfaces. The coating shall be UL recognized for outdoor use. The coating color shall be ANSI 49.

I. Maximum sound levels shall not exceed the following when tested according to IEEE Standard C57.12.91.

1. 0 – 9 kVA: 37 dB

J. Transformers 45 KVA and less shall be suitable for wall, floor, or trapeze mounting; transformers larger than 45 KVA shall be suitable for floor or trapeze mounting. Provide mounting accessories required for installation.

K. Provide transformer manufacturer's transformer lug kits with compression type equipment lugs and hardware for connecting conductors to transformer terminals.

L. Manufacturer:

1. Approved manufacturers shall be registered firms in accordance with ISO 9001:1994 SIC 3612 (US); which is the design and manufacture of low voltage dry type power, distribution and specialty transformers.

2. Square D

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine surfaces to receive transformers for compliance with installation tolerances and other conditions affecting performance of the control system. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install dry-type transformers where indicated on the Drawings and according to manufacturer's instructions. Manufacturer's installation instructions shall be available at the construction site.

B. Install transformers according to NECA 409 Recommended Practice for Installing and Maintaining Transformers (ANSI).

C. Use liquid-tight flexible conduits, 2 ft. minimum lengths, for connections to transformer case. Make conduit connections to transformer enclosure only at locations designated by the manufacturer's installation instructions.

D. Connect conductors to transformer terminals using transformer manufacturer's lug kits. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. Where manufacturer's torque values are not furnished, use those specified in UL 486A-486B.

E. Bond transformers and ground systems served by transformers according to Section 16050, *Basic Electrical Materials and Methods.*

F. Identify transformers and install warning signs according to Section 16050, *Basic Electrical Materials and Methods.*

3.3 FIELD QUALITY CONTROL

A. Clean, inspect, test, adjust, and energize transformers in accordance with NECA 409.

1. Inspect each transformer for physical damage, proper connection and grounding, and proper anchorage.

B. Coordinate inspections and tests with those required by Section 16950 – *Electrical Tests*.

C. After completing installation, cleaning, and testing, touch up scratches and mars on finish to match original finish.

D. Measure primary and secondary voltages and phase rotation, and make preliminary tap adjustments. After normal operating loads have been energized adjust taps to provide the following voltage at points of use; record voltages and tap settings.

System Nominal Voltage	Minimum Load Voltage
208/120	200/115

END OF SECTION

SECTION 16485
LOCAL CONTROL PANELS

PART 1 -- GENERAL

1.1 WORK OF THIS SECTION

A. The Contractor shall provide local control panels (LCPs) complete and operable, in accordance with the Contract Documents.

1.2 RELATED SECTIONS

A. The Work of the following Sections applies to the Work of this Section. Other Sections, not referenced below, shall also apply to the extent required for proper performance of this Work.

1. Section 16050 Basic Electrical Materials and Methods
2. Section 16400 Low Voltage Electrical Service and Distribution
3. Section 16700 Supervisory Control Data Acquisition (SCADA)
4. Section 16900 Controls and Instrumentation

1.3 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

A. LCPs shall comply with the requirements of NEC, NEMA, and UL.

1.4 CONTRACTOR SUBMITTALS

A. The Contractor shall submit shop drawings in accordance with Section 01300 - Submittals and Section 16050 - Basic Electrical Materials and Methods.

B. Ladder diagrams and written descriptions explaining ladder diagrams operation and system operation shall be submitted.

C. The Contractor shall submit catalog cuts of all control equipment including enclosures, overcurrent devices, relays, pilot devices, terminations, and wire troughs.

PART 2 -- PRODUCTS

2.1 GENERAL

A. The Contractor shall provide LCPs to satisfy the functional requirements in other Sections and as indicated on the Drawings. Each LCP shall be fabricated with UL label components. Panels not specifically provided in other Sections shall be provided under this

Section. LCPs shall be wired as provided in this Section.

B. The LCP controls shall be 120 V maximum. Where the electrical power supply to the LCP is 240 V single phase, or 480 V, 3-phase, the LCPs shall be provided with a fused control power transformer. Control conductors shall be provided in accordance with Section 16050 - Basic Electrical Materials and Methods.

C. Each LCP shall be provided with identified terminal strips for the connection of all external conductors. Provide sufficient terminal blocks to connect 25% additional conductors for future use. Termination points shall be identified in accordance with accepted shop drawings. The LCPs shall be the source of power for all 120 VAC solenoid valves interconnected with the LCPs. All equipment associated with the LCPs shall be ready for service after connection of conductors to equipment, controls, and LCPs. Terminal strips for AC and DC signal wires shall be separated from each other.

D. All internal wiring shall be factory-installed and shall be contained in plastic wireways having removable covers. Wiring to door-mounted devices shall be extra flexible and be anchored to doors using wire anchors cemented in place. Exposed terminals of door-mounted devices shall be guarded to prevent accidental personnel contact with energized terminals. DC and AC control signal wires shall be installed in separate wireways.

E. Conduit penetrations into Control Panel shall be bottom only. No top or side penetrations are allowed.

F. Enclosures including SCADA Control panel:

1. In finished rooms, enclosures shall be NEMA 12 painted steel enclosures with ANSI 61 exterior and white interior. Enclosures shall be Hoffman or equal.

2. In all other non-hazardous areas enclosures, shall be NEMA 4X stainless steel (before modifications) with brushed finish. Where possible, penetrations shall be made in such a manner to maintain the NEMA 4X rating. If this is not possible, the penetrations shall be made in such a manner to minimize entry of foreign materials into the enclosure. Enclosures shall be Hoffman or equal.

3. In hazardous areas, enclosures shall be cast aluminum NEMA 7 and shall be UL Listed for use in hazardous or classified locations. Enclosures shall be Crouse-Hinds or Appleton.

4. Enclosures shall be either pedestal-mounted, or equipment skid- mounted, as indicated. Internal control components shall be mounted on a removable mounting pan. The mounting pan shall be finished white. Enclosure shall include a fluorescent light fixture, a light switch, and duplex receptacle, all controlled by 15 A circuit breaker with trip indicator and auxiliary contact.

5. Enclosures should not exceed six (6) feed in height.

6. Include panel folding shelf in panel enclosure.

7. SCADA enclosure shall be sized to permit addition of twenty-five percent (25%) additional control devices to be installed in enclosure.

G. The main feeder disconnect shall have a door-mounted handle unless otherwise indicated.

H. Identification of panel-mounted devices, conductors, and electrical components shall meet the requirements specified in Section 16050 - Basic Electrical Materials and Methods.

I. All panel-mounted devices shall be mounted a minimum of 3 feet above finished floor elevation. Panel devices shall not be mounted more than 6 feet above finished floor.

2.2 LCP COMPONENTS

A. Pushbuttons, selector switches, and pilot lights shall be of the heavy-duty, oil-tight type sized to 30 mm. Miniature style devices are not acceptable. Devices shall be as manufactured by Square-D, Allen-Bradley, or equal.

1. Lens colors shall be red for "run," "open," or "on"; green for "stopped," "closed," or "off;" amber for alarm.

2. Pilot lights shall be full voltage LED cluster style.

3. Provide hazardous location type pilot devices in classified locations.

B. Relays shall be 3 PDT with 10 A contacts, plug-in type using rectangular blades and provided with sockets for screw-type termination and hold-down clips. Relays shall be as manufactured by Square D, Potter Brumfield, or equal.

C. Elapsed time meters shall be non-resettable type, read to a maximum of 99999.9 hours and shall be as manufactured by Eagle Signal, Westinghouse, or equal.

D. Magnetic starters shall meet the following requirements:

1. NEMA rated or Dual NEMA/IEC rated type.

2. FVNR type unless indicated otherwise.

3. Combination starters with magnetic only instantaneous trip circuit breakers such a Westinghouse "MCP," Square-D, "Mag-Gard," or equal.

E. Current-to-current converter/isolators shall be 4-20 mA input, 4-20 mA output for operation from 120 VAC power, and shall be by Moore, A.G.M., or equal.

F. Process alarm relays shall have a 4-20 mA input and two independent SPST contact outputs as manufactured by A.G.M., or equal. Power input shall be 120 VAC.

G. Digital indicators shall have 4-20 mA input and shall display the signal in process units. 0-100% as a displayed signal shall only be acceptable to indicate speed. Indicators shall be as manufactured by Newport, Red Lion, or equal for operation from 120 VAC. Splash-proof covers shall be provided in NEMA 4X panels, and viewing windows shall be provided in NEMA 7 panels.

H. Single and multi-loop controllers shall have the following features:

1. Analog and digital inputs and outputs as indicated on the Drawings.

2. Process & Instrumentation Diagram control algorithms.

3. Graphic display indicating input, setpoint and all alarms.

4. Operate on 120 VAC. Face shall be approximately 3 inches wide by 6 inches high.

5. Unit shall be provided completely programmed and ready for use. Include a portable programming device.

6. Provide window kit for the LCP enclosure over all controllers.

7. Unit shall be Fischer and Porter Model 53MC5000, or equal.

I. Manual loading stations shall have 4-20 mA outputs and 4-20 mA inputs for remote or auto control. Switching from local and remote or from manual to auto shall be by means of controls on the face of the unit or by isolated contact closure as indicated on the Drawings. Provide window kit for the LCP enclosure over all manual loading stations. Manual loading station shall be as manufactured by Fischer and Porter, or equal.

J. Time delay relays shall be combination on delay and off delay (selectable) with adjustable timing ranges. Time delay relays shall be Square D JCK70. Provide socket with screw terminal connections and retaining strap. Similar shall be by ATC, or equal.

K. Programmable logic controller(s) (PLCs) may be supplied within the LCP in lieu of relays, provided the PLCs match the PLCs furnished under Section 13374 - Control Panel Instrumentation.

L. Reset Timers: Reset timers shall be synchronous motor driven with a solenoid operated clutch. Timer shall be on-delay for semi-flush panel-mounting. The timers shall be rated 120-V, 60 Hz, with 10-A rated contacts, and with time range as shown, and shall be Eagle Signal Division E.W. Bliss Company Bulletic 125, Automatic Timing and Controls, Inc., Type 305, or equal.

2.3 FACTORY TESTING

A. Each LCP shall be factory assembled, and tested for sequence of operation before delivery to the jobsite. The City reserves the right to witness factory tests.

2.4 SPARE PARTS

A. The Contractor shall furnish a minimum of 10% spare lamps (minimum 2) and one spare lens for each color pilot lamp in each panel.

PART 3 -- EXECUTION

3.1 INSTALLATION

A. LCPs shall be installed in accordance with Section 16050 - Basic Electrical Materials and Methods, and in accordance with the manufacturer's recommendations.

B. LCPs shall be protected at the job site from loss, damage, and the effects of weather. LCPs shall be stored in an indoor, dry location. Heating shall be provided in areas subject to corrosion, and humidity.

C. LCP interiors and exteriors shall be cleaned, and coatings shall be touched up to match original finish upon completion of the Work.

D. Conduit, conductors, and terminations shall be installed in accordance with the Section 16050 - Basic Electrical Materials and Methods.

E. A ground lug for a size No. 2 AWG bare copper conductor shall be included to ground LCP to the plant's grounding system.

F. A copy of the final (as-built) wiring diagrams shall be placed in a metal pocket provided inside of the LCP door.

3.2 FIELD TESTING

A. Each LCP shall be tested again for functional operation in the field after the connection of external conductors, and prior to equipment startup.

END OF SECTION

SECTION 16510
INTERIOR LIGHTING SYSTEMS

PART 1 GENERAL

1.1 SUMMARY

A. SECTION INCLUDES

1. Interior luminaires and accessories
2. Lamps
3. LED Drivers

B. DEFINITIONS:

1. Luminaire: A luminaire is a complete lighting unit including light source(s) and parts required to distribute the light, position and protect the light source(s), and connect the light source(s) to the power supply.
2. Average Life: The time after which 50 percent will have failed and 50 percent will have survived under specified operating and starting condition.
3. Total harmonic distortion (THD): The root mean square (RMS) of all the harmonic components divided by the fundamental current.

1.2 SUBMITTALS

A. Submit the following in accordance with project submittal procedures:

1. Catalog Data: Submit catalog data describing luminaires and drivers. Include data substantiating that materials comply with specified requirements. Arrange data for luminaires in the order of fixture designation.
2. Performance Curves/Data:
   a. Submit certified photometric data for each type of luminaire.
   b. Submit supply-air, return-air, heat-removal, and sound performance data for air handling luminaires.
3. Drawings: Submit shop drawings for non-standard luminaires.
4. Warranty: Submit warranties for luminaires and for drivers.

1.3 QUALITY ASSURANCE

A. Comply with the *National Electrical Code* (NEC) and the *International Building Code (IBC)* for components and installation.

B. Provide luminaires listed and labeled by a nationally recognized testing laboratory (NRTL) for the application, installation condition, and the environments in which installed.

C. Use manufacturers that are experienced in manufacturing luminaires, lamps and drivers similar to those indicated for this Project and have a record of successful in-service performance.

D. Coordinate luminaires, mounting hardware and trim with the ceiling system.

1.4 SERVICE CONDITIONS

A. Luminaires, lamps and drivers shall perform satisfactorily in the following service conditions:

1. Ambient temperature limits: 32 to 104 degrees F unless indicated otherwise for specific products in Part 2.

1.5 EXTRA MATERIALS

A. Furnish the following extra materials matching products installed. Package with protective covering for storage and identify with labels describing contents.

1. Five (5) percent of quantity of LED "lamps" of each type, but no fewer than two lamps of each type.

2. One (1) percent of quantity of louvers and lenses of each type, but not less than one of each type.

3. One (1) percent of quantity of LED drivers of each type, but not less than one of each type.

1.6 WARRANTY

A. LED Luminaires: Submit a warranty, mutually executed by the LED luminaire manufacturer and the installer, agreeing to replace LED luminaires that fail in materials or workmanship within five years, beginning on the date of City acceptance

1.7 RECEIVING, STORING AND PROTECTING

A. Receive, store, and protect, and handle products according to the following NECA National Electrical Installation Standards:

1. NECA/IESNA 500, *Recommended Practice for Installing Indoor Commercial Lighting Systems* (ANSI)

2. NECA/IESNA 502, *Recommended Practice for Installing Industrial Lighting Systems* (ANSI)

PART 2 PRODUCTS

2.1 PRODUCT OPTIONS AND SUBSTITUTIONS

A. Alternate products may be accepted; follow requirements of *Standard Specifications for Public Works Construction* ("Whitebook"), 2015 edition.

2.2 LED LUMINAIRES

A. For LED lighting in interior spaces, use NRTL-listed 120V or 277V luminaires with the performance characteristics listed below:

1. Minimum luminaire efficacy per IES LM-79-08, *Approved Method: Electrical and Photometric Measurement of Solid-State Lighting Products*:

a. 90 lumens/watt for general lighting,

2. Correlated color temperature (CCT) per IES LM-79-08 and ANSI/NEMA/ANSLG C78.377-2008, *Specification for the Chromaticity of Solid-State Lighting (SSL) Products*:

   a. 3500 °K for general lighting and down-lighting,

3. Color rendering index (CRI): 90 or better per IES LM-79-08.

4. LED Design life (L70): Not less than 50,000 hours per IES LM-80-08, *Approved Method: Measuring Lumen Maintenance of LED Light Sources*.

5. Driver System Design Life: Not less than the LED design life; note that the driver system includes all associated components, not just the driver integrated circuit. Driver system design life is defined as when 2 percent of the systems would have failed.

6. Power factor: 0.90 or better.

7. Design ambient temperature: 35 °C (95 °F); note that this is the ambient temperature surrounding the luminaire, not the LED or driver heat-sink temperature.

8. EMI/RFI: Meet FCC 47 CFR Part 15.

9. Minimum dimming provisions or capability:

   a. 50% step for general lighting,

   b. Down to 20% for accent and display lighting, and special purpose lighting.

B. Manufacturers:

1. LED Low Bay: Metalux. "TBLED Series" or City approved equal.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install interior lighting system in accordance with the NEC, manufacturer's installation instructions, approved shop drawings, and the following NECA National Electrical Installation Standards:

1. NECA/IESNA 500, *Recommended Practice for Installing Indoor Commercial Lighting Systems* (ANSI)

2. NECA/IESNA 502, *Recommended Practice for Installing Industrial Lighting Systems* (ANSI).

B. Have the manufacturer's installation instructions available at the Project site.

C. Mounting heights specified or indicated on the Drawings are to the bottom of the luminaire for ceiling-mounted fixtures and to the center of the luminaire for wall-mounted fixtures.

D. Where the ceiling forms the protective membrane of a fire resistive assembly, install protective coverings over luminaires in accordance with NRTL requirements.

E. Install slack safety wires as described below for luminaires in or on suspended ceilings.

1. Wire shall be minimum 12 gage galvanized soft annealed steel wire conforming to ASTM A641.

2. Attach wire to the building structure directly above the attachment point on the box or luminaire; make trapezes of framing channel material as required to span obstacles

3. Secure wire(s) at each end with not less than three tight turns in 1-1/2 inches.

F. Support pendant-mounted or cable-supported luminaires directly from the structure above using a 9 gage wire or an approved alternate support without using the ceiling suspension system for direct support.

1. Install seismic restraints for pendant-mounted and cable-supported luminaires.

2. Pendants, rods, cables, or chains 4 ft or longer shall be braced to prevent swaying using three cables at 120 degrees separation.

G. Connect luminaires in suspended ceilings using 6 ft. lengths of flexible wiring method arranged accommodate not lea than 4 inches of differential seismic movement in any direction. Refer to Section 16050, *Basic Electrical Materials and Methods*.

3.2 FIELD QUALITY CONTROL

A. Make electrical connections, clean interiors and exteriors of luminaires, install lamps, energize and test luminaires, inspect interior lighting system, and deliver spare parts in accordance with manufacturer's instructions and the following NECA National Electrical Installation Standards:

1. NECA/IESNA 500, *Recommended Practice for Installing Indoor Commercial Lighting Systems* (ANSI)

2. NECA/IESNA 502, *Recommended Practice for Installing Industrial Lighting Systems* (ANSI)

B. Prior to turnover to City of San Diego, replace lamps that were installed and used during construction if more than 15 percent of their rated lamp life has been used.

END OF SECTION

SECTION 16525
EXTERIOR LIGHTING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Exterior luminaires and accessories

B. Grounding

C. Conduit and wiring

D. Lighting controls

1.2 QUALITY ASSURANCE

A. Comply with the following codes and standards:

1. *National Electrical Code* (NEC) for components and installation.
2. International Building Code
3. The national Energy Policy Act and Energy Star requirements for lighting products.

B. Provide luminaires listed and labeled by a nationally recognized testing laboratory (NRTL) for the application, installation condition, and the environments in which installed.

C. Use manufacturers that are experienced in manufacturing poles, luminaires, lamps and ballasts similar to those indicated for this Project and have a record of successful in-service performance.

1.3 SERVICE CONDITIONS

A. Elevation: 470 feet above sea level.

B. International Building Code and ASCE 7 design wind conditions:

1. Exposure Category: C
2. Basic Wind Speed: 90 mph (3-second gust at 33 ft above ground, mean recurrence interval of 50 years)
3. Importance Factor: 1.00.

C. Ambient temperatures, deg C (deg F):

1. Annual averages: 14.1 (57.3) minimum, 22 (72) maximum
2. Annual extremes: 4.6 (40.3) minimum, 32 (90) maximum

1.4 DEFINITIONS

A. Unless otherwise specified or indicated, terms used in this Section are as defined in the National Electrical Code or the IESNA Lighting Handbook.

1.5 SUBMITTALS

A. Submit the following in accordance with project submittal procedures.

1. Catalog Data: Submit catalog data describing poles, luminaires, lamps, ballasts, and pole and luminaire finishes. Include data substantiating that materials comply with specified requirements. Arrange data for luminaires in the order of luminaire designation.
2. Performance Curves/Data: Submit certified photometric data for each type of luminaire.
3. Shop Drawings: Submit manufacturer's drawings for non-standard luminaires.
4. Maintenance Data: Submit maintenance instructions for inclusion in the operations and maintenance manuals.
5. Warranties: Submit warranties for light emitting diode (LED) luminaires.

1.6 EXTRA MATERIALS

A. Furnish the following extra materials matching products installed. Package with protective covering for storage and identify with labels describing contents.

1. LED Luminaires: 5 percent of quantity of LED luminaires of each type, but no fewer than two of each type.
2. Photoelectric Relays: 5 percent of quantity of photoelectric relays of each type, but not less than two of each type.
3. Fuses: 5 percent of quantity of fuse of each type, but not less than two of each type.

1.7 RECEIVING, STORING AND PROTECTING

A. Receive, inspect, handle, and store products according to the manufacturer's written instructions and NECA/IESNA 501, *Recommended Practice for Installing Exterior Lighting Systems.*

PART 2 PRODUCTS

2.1 PRODUCT OPTIONS AND SUBSTITUTIONS

A. Alternate products may be accepted; follow requirements of *Standard Specifications for Public Works Construction* ("Whitebook"), 2015 edition.

2.2 FINISHES

A. Furnish luminaires, poles, and accessories with finishes as scheduled that are resistant to fading, chalking, and other changes due to aging and exposure to heat and ultraviolet light. Acceptable finishes for metals are:

1. Hot-dipped galvanized steel: ASTM A 123/A 123M.
2. Brushed natural aluminum
3. Anodized aluminum: AAMA 611, *Anodized Architectural Aluminum*, Class I.
4. Powder coated aluminum: Fluorocarbon polymer powder coating per AAMA 2605, *Superior Performing Organic Coatings* over chrome phosphate conversion coated aluminum.
5. Powder coated steel: Fluorocarbon polymer powder coating per AAMA 2605, *Superior Performing Organic Coatings* over zinc phosphate conversion coated shot-blasted steel.

B. Reject luminaires, poles, and accessories with finish having runs, streaks, stains, holidays and defects.

C. Replace luminaires, poles, and accessories showing evidence of yellowing, fading, chalking, and other changes indicating failure during warranty period.

D. Use stainless steel for exposed hardware.

2.3 EXTERIOR LUMINAIRES - GENERAL

A. Furnish exterior luminaires that comply with requirements specified in this Section and in the luminaire schedule on the Drawings.

B. Luminaires shall be NRTL-listed as conforming to UL 1598 - *Luminaires.*

C. Photometric characteristics shall be based on IESNA approved methods for photometric measurements performed by a recognized photometric laboratory.

D. Luminaire housing shall be primarily metal.

1. Metal parts shall be free from burrs and sharp corners and edges.
2. Sheet metal components shall be fabricated from corrosion-resistant aluminum, formed and supported to prevent sagging and warping.
3. Exposed fasteners: Stainless steel.

E. Doors and frames shall be smooth operating and free from light leakage under operating conditions.

1. Doors, frames, lenses and diffusers shall be designed to prevent accidental falling during relamping and when secured in the operating position.

2. Door: Removable for cleaning or replacing lens.

F. Luminaire minimum reflecting surface reflectance: As follows unless scheduled otherwise:

1. White surfaces: 85 percent

2. Specular surfaces: 83 percent

3. Diffusing specular surfaces: 75 percent

G. Provide lenses, diffusers, covers and globes as scheduled on the Drawings fabricated from materials that are UV stabilized to be resistant to yellowing and other changes due to aging or exposure to heat and ultraviolet radiation.

H. Doors shall have resilient gaskets that are heat-resistant and aging-resistant to seal and cushion lens and refractor.

2.4 LED LUMINAIRES

A. Conform to UL 1598 and to UL 8250 – *Safety Standard for Light-Emitting Diode (LED) Light Sources for Use in Lighting Products.*

B. Lead and mercury free.

C. Photometric characteristics: Established using IESNA LM-79-08, *IESNA Approved Method for the Electrical and Photometric Measurement of Solid-State Lighting Products.*

D. Ingress protection for optical assembly: IP65 or better in accordance with ANSI/IEC 60529 - *Degrees of Protection Provided by Enclosures.*

E. Color characteristics as follows in accordance with ANSI C78.377 – *Specifications for the Chromaticity of Solid State Lighting Products:*

1. Color temperature (deg K): 5000 to 6500

2. Color rendering index: not less than 70

F. LED and driver cooling system: Passive and shall resist the buildup of debris.

G. LED luminaire output after 50,000 hours of operation: Not less than 70 percent of the initial lumen output when determined in accordance with IESNA LM-80-08 – *IESNA approved Method for Measuring Lumen Maintenance of LED Lighting Sources.*

H. LED luminaire electrical characteristics:

1. Supply voltage: 120 V or 277 V as indicated on the Drawings. Provide step-down transformers if required to match driver input voltage rating.

2. Total harmonic distortion (current): Not more than 20 percent

3. Power factor: Not less than 90%

4. RF interference: Meet FCC 47 CFR Part 15/18

5. Driver input surge protection device: UL 1449 3rd Edition recognized component meeting IEEE C62.41.2 - *IEEE Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and Less) AC Power Circuits*, Category C, High Exposure.

I. Warranty:

1. Manufacturer shall replace any luminaires that fail to operate properly within 60 months of the date of City acceptance of the installation. Lens yellowing or hazing will be considered a failure.

2. Manufacturer shall replace any luminaires that experience housing or finish failure within 5 years of the date of City acceptance of the installation.

J. Manufacturer:

1. Minka Lavery "8763" series or City approved equal.

2.5 LIGHTING CONTROL EQUIPMENT

A. Furnish photoelectric relays to control exterior lighting as indicated on the Drawings.

1. For photoelectric relays not mounted on luminaires use products conforming to either UL 773 or UL 773A, *Non-industrial Photoelectric Switches for Lighting Control*. Provide the photoelectric relays with single-pole double-throw contacts to switch mechanically-held contactors.

2. Photoelectric relay contacts shall be factory set to turn exterior lighting "ON" at or below 3 footcandles and "OFF" at 4 to 10 footcandles. A time delay shall prevent switching from transient light sources.

B. Furnish one or more time switches to control exterior lighting as indicated on the Drawings.

1. Use a mechanical astronomic dial type or an electronic type time switch, arranged to turn "ON" at sunset and turn "OFF" at predetermined time between 8:30 p.m. and 2:30 a.m. or sunrise, automatically changing the settings each day in accordance with seasonal changes

2. Time switch shall have either an automatically wound spring mechanism or an energy-storage capacitor to maintain accurate time for a minimum of 7 hours following power failure.

3. Time switch shall have double-throw contacts to switch mechanically-held contactors and a manual on-off bypass switch.

4. Provide time switch with NEMA 3R housing if installed outdoors or NEMA 1 housing if installed indoors.

C. Furnish a "hand-off-auto" control switch and enclosure to facilitate testing of the lighting system.

D. Furnish one or more multi-pole lighting contactors to control exterior lighting as indicated on the Drawings.

1. Mechanically-held or contactors shall conform to NEMA ICS 2 Industrial Controls and Systems: Controllers, Contactors, and Overload Relays.

2. Contactors shall have the number of contacts as indicated on the Drawings or as required by the number of circuits to be controlled. Contacts shall have a minimum rating of 30 amperes at 277 volts AC per pole for ballast loads. Contacts shall be field-convertible from normally-open to normally-closed.

3. Use 120 volts AC operating coils.

4. Provide contactor with NEMA 3R housing if installed outdoors or NEMA 1 housing if installed indoors.

5. Use 600 volt, Class CC, time-delay, current-limiting fuses.

6. Select fuses rated between 200% and 300% of the luminaire ballast or driver maximum current.

E. Manufacturer:

1. Douglas Lighting Control, Lite Pak or City approved equal

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine areas, spaces, and surfaces to receive exterior luminaire (s) or poles for compliance with installation tolerances and other conditions affecting performance of the product. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install products in accordance with manufacturer's instructions, NECA/IESNA 501, and approved shop drawings.

B. Locations of luminaires shown on the Drawings are diagrammatic. Coordinate luminaire locations with building finishes, building structure, paving and striping, utility piping, security fences, and existing trees. Obtain approval for location changes through Resident Engineer.

C. Install surface mounted luminaires directly to an outlet box which is supported from structure.

D. Install lamps in luminaires in accordance with manufacturer's instructions.

3.3 GROUNDING

A. Install grounding for exterior lighting using materials and methods specified in Section 16050, *Basic Electrical Materials and Methods*.

3.4 LIGHTING CONTROL SYSTEM

A. Install exterior lighting control system components in accordance with the manufacturers' instructions. Have installation instructions available at the construction site.

B. Install a HAND-OFF-AUTO selector switch in the control system to allow for testing of luminaires.

C. Provide separate control of exterior lighting system as follows:

1. Safety, security, pedestrian walkway, and roadway lighting: "ON" at dusk, "OFF" at dawn.

3.5 RACEWAYS AND BOXES

A. Install conduit system for exterior lighting using materials and methods specified in Section 16050, *Basic Electrical Materials and Methods*.

3.6 BUILDING WIRE

A. Install wiring for exterior lighting using materials and methods specified in Section 16050, *Basic Electrical Materials and Methods*.

3.7 FIELD QUALITY CONTROL

A. Inspect each installed lighting unit for damage. Replace damaged luminaires and components.

B. Test installed luminaires for proper operation.

1. Provide instruments to make and record test results.

2. Replace or repair malfunctioning luminaires and components then re-test.

3. Repeat procedure until all luminaires operate properly.

C. Replace inoperative lamps.

D. Check poles for signs of vibration induced by 10 to 30 mph wind: visible swaying, loosened anchor bolt nuts, vibration perceptible by touch, or wires rattling inside pole. Notify the Resident Engineer and the pole manufacturer – vibration mitigation devices may be required.

3.8 ADJUSTING AND CLEANING

A. Clean each luminaire inside and out, including plastics and glassware. Use methods and materials recommended by manufacturer.

END OF SECTION

SECTION 16700
SUPERVISORY CONTROL AND DATA ACQUISITION (SCADA)

PART 1 - GENERAL

1.1 WORK OF THIS SECTION

A. The WORK of this Section includes providing the following:

1. Supervisory Control and Data Acquisition (SCADA)/Telemetry.

a. The Supervisory Control and Data Acquisition System (SCADA) for the City of San Diego Water Department consists of master monitoring and control stations located at Chollas SCADA Control Center. The SCADA equipment is a Kapsch DYNAC System and associated communication hardware and software to communicate to remote PLC/DCS stations throughout the City of San Diego.

Additionally, the Overall Control System is comprised of a Kapsch DYNAC Supervisory Control and Data Acquisition (SCADA) system including Modicon QUANTUM and MOMENTUM series Programmable Logic Controllers (PLC's) processors and Microwave Data System (MDS) Spread Spectrum radio components.

b. The pump station PLC shall communicate to the SCADA system remotely via the existing MDS Spread Spectrum Radio infrastructure. This radio communication will be channeled through an intermediate Master Radio system located at the nearest mountain top. These will be used for re-transmission to/from DYNAC SCADA system. The CONTRACTOR is responsible for furnishing, installing, and commissioning all of the radio telemetry devices of the pump station. The City is responsible for orienting the antenna to the nearest line of sight master station, including configuration of the radio modem and device frequencies addressing. The DESIGN CONSULTANT is responsible for calculating process set points and the development of a process control strategy. The CONTRACTOR is responsible for interpreting the DESIGN CONSULTANT control strategy and programming and configuring the PLC with the soft and hard inputs and outputs. The standard PLC software is Unity XL Pro software no substitutions. The CONTRACTOR shall program the PLC logic with Derived Function Block (DFB) approved standard. The City shall provide a current DFB sample PLC logic program. The CONTRACTOR is responsible for fully furnishing the pump station with all the specified instrumentation devices including installation testing, and commissioning. Prior to commissioning THE CONTRACTOR shall validate all instrumentation device control loops on the pump station and the City shall witness and confirm the workings of each control loop in the pump station.

c. The CONTRACTOR shall configure the following points, as a minimum, to be transmitted from pump station to the Chollas SCADA Control Center utilizing this radio telemetering system. These points where applicable shall be for each of the pump parameters at the pump station. The points

listed are comprised of both "hard" (hardwired) and soft (PLC generated) points.

(1) Motor Control power available
(2) Generator running
(3) Generator failure
(4) Pump Station intrusion
(5) Supply Fan running
(6) Exhaust Fan running
(7) Pump Room flood low
(8) Pump Room flood high
(9) UPS on backup battery
(10) Pump SS-1 failure
(11) Pump SS-1 start sequence failure
(12) Pump VFD-1 failure
(13) Pump VFD-1 start sequence failure
(14) Pump SS-2 failure
(15) Pump SS-2 start sequence failure
(16) Pump VFD-2 failure
(17) Pump VFD-2 start sequence failure
(18) Pump SS-3 failure
(19) Pump SS-3 start sequence failure
(20) Pump VFD-3 failure
(21) Pump VFD-3 start sequence failure
(22) Pump # check valve failure
(23) PLC low battery

d. The CONTRACTOR shall configure the following points, as a minimum, to be transmitted from pump station to the Chollas SCADA Control Center utilizing this radio telemetering system. These points where applicable shall be for each of the pump parameters at the pump station. The points listed are comprised of both "hard" (hardwired) and soft (PLC generated) points.

2. City is responsible for the HMI configuration and addition of pump station in to the SCADA database. City will provide the following:
a. Addressing
b. GUI development
c. Data achieved

1.2 RELATED SECTIONS

A. The WORK of the following Sections 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 01300 - Submittals
2. Section 16050 – Basic Electrical Materials and Methods

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. National Electrical Code

1.4 SPECIFICATIONS AND STANDARDS

A. Except as otherwise indicated, the specifications and standards for this WORK shall include the current editions of the specifications and standards of Section 16050 and other applicable specifications and standards.

1.5 SHOP DRAWINGS AND SAMPLES

A. General.

1. Submittals shall comply with the requirements of Section 01300.

2. Submittals for all instrumentation and control equipment shall be submitted to the City. The submittal package for each individual equipment or groups of related equipment shall be complete.

3. The CONTRACTOR shall submit the manufacturers' statements accepting unit responsibility.

B. Not Used.

C. Shop Drawings and Other Submittal Data.

1. Contract Drawings:

a. The drawings are generally diagrammatic unless detailed or dimensioned. The exact locations and routing or wiring, conduit and pipe shall be governed by structural conditions, physical interferences and location of terminations of equipment.

b. The CONTRACTOR shall examine the architectural, structural, mechanical, electrical and instrumentation plans and shop drawings for the equipment in order to determine the exact routing and final terminations of conduit, cables and pipes. Conduits and pipes shall be stubbed as near as possible to equipment terminals.

2. Deviations From Specifications: Should Contractor's proposed system designs deviate from the specifications; such deviation shall be documented and submitted to the City for approval. All deviations shall be stated on the submittal transmittal sheet.

3. Organization and Binding of Submittals:

a. The initial and subsequent submittals of drawings and data for review shall be organized and bound so that eventually they may be used as guides for

preparing the maintenance manuals required under Part 1.5C of this Section. Therefore, the initial submittal of drawings and data, and all copies of subsequent submittals, shall be bound in standard size, 3 ring, loose-leaf, vinyl plastic hard cover binders suitable for bookshelf storage, except as noted. Binder size shall not exceed 3-inch rings.

b. Cabinet, panel and console detail drawings shall be prepared and submitted on a uniform size paper not in excess of 22 by 34 inches; these drawings shall be submitted in a roll, in order by subject, and shall neither be folded, nor bound. Other details and drawings to be bound in the 3 ring binders shall be prepared on 8-1/2 by 11-inch or on 11 by 17-inch paper.

c. The submittal shall be organized in three parts, not including preliminary administrative material such as table of contents, as follows:

Part 1 shall consist of a series of sections, one for each process control system. Each section shall be divided by a tab and shall include the material specified below.

Part 2 shall include outline dimension drawings for panels, cabinets, consoles and the like, as specified below.

Part 3 shall include data on miscellaneous parts and accessories not included in Part 1.

4. Submittals:

a. General: The CONTRACTOR shall submit to the City for review, five sets of detailed drawings and data prepared and organized by the systems organization designated at the time of bidding. These drawings and data shall be submitted as a complete package at one time within 30 calendar days of the Notice to Proceed with the Project. The content, organization and binding of this submittal shall be as specified below.

b. Data Sheets: These data sheets shall be in a standardized format and shall include the following:

(1) Component name used herein and on the drawings.

(2) Manufacturer's model number or other product designation.

(3) Project tag number.

(4) System of which the component is a part.

(5) Location or assembly at which the component is to be installed.

(6) Input and output characteristics.

(7) Scale range and units (if any) and multiplier (if any).

(8) Requirements for electric supply (if any).

(9) Requirements for air supply (if any).

(10) Materials of component parts to be in contact with, or otherwise exposed to, process media.

(11) Reference to Manufacturer's descriptive technical bulletin or brochure.

(12) Reference to other features so that all specified features are stated on the data sheet.

c. Technical Product Bulletins or Brochures: Following each data sheet, a technical product bulletin, or brochure (or clear Xerox copy thereof) shall be inserted; this shall provide amplifying technical information on the, characteristics, and capabilities of the component described in the related data sheet. Elaborate and extensive technical details shall not accompany these bulletins. All bulletins shall be of the most recent issue.

d. Data Sheets and Catalog Data for Accessories: Part 3 of the submittal shall consist of a series of data sheets for accessory components together with supporting catalog pages or bulletins (or clear Xerox copies thereof). These shall be arranged in a logical sequence and shall cover such items as:

(1) Control circuit devices, components and wiring.

(2) Pneumatic components, fittings and tubing.

e. Cabinets, Panels, and Consoles: Part 2 of the submittal shall include outline and dimension drawings for all enclosed assemblies including cabinets, panels, consoles and the like. These drawings shall show the arrangements of panel-mounted and internally mounted components to scale and shall include enough other details, to clearly establish the style and overall appearance of each assembly.

D. Operation and Maintenance Manuals.

1. General:

a. Before payment of the 75 percent progress payment, the CONTRACTOR shall provide final sets of maintenance manuals. Prior to this, two sets of preliminary manuals shall be submitted to the City within 60 days after return of favorably reviewed shop drawings and data required above.

b. Following the review of the preliminary manuals, one set will be returned to the CONTRACTOR with comments. The final five (5) sets shall be prepared and submitted to the City at least 30 days prior to start-up of systems and shall reflect as-built conditions.

2. Content:

a. A set of manuals shall include all the drawings and required data and shall be organized and bound as specified for the review submittals. These drawings and data shall be supplemented with installation, connection, operating, troubleshooting, maintenance and overhaul instructions in complete detail. This shall provide the City with comprehensive information on all systems and components to enable operation, service, maintenance and repair. Exploded or other detailed views of all instruments, assemblies and accessory components shall be included together with complete parts lists and ordering instructions.

b. In addition to the requirements set forth elsewhere, the instruction manuals shall consist of at least the following:

(1) Table of contents.
(2) System block and schematic diagrams.
(3) Component schematic diagrams.
(4) Written, verbal, step-by-step operating, trouble-shooting and calibrating instructions for each of the systems and each of the components of each system.
(5) As-built electrical and control drawings.
(6) Letter from CONTRACTOR that as-builts have been checked for proper indication of equipment, wiring numbers etc.
(7) Warranty contracts, warranty service information for all equipment.

1.6 QUALITY ASSURANCE

A. Acceptable Manufacturers.

1. Furnish instruments, devices, control and SCADA equipment by the named manufacturers.

2. The named manufacturers have been specified to establish a City wide standard for quality and performance of the equipment supplied.

3. Obtain all instruments or devises of a given type from the same manufacturer.

B. Verification Process.

1. At least one level of verification processes shall be provided to insure consistency and to avoid mismatch. This will be for all procured equipment and designs developed for a specific project.

C. Unit Responsibility. Equipment systems made up of two or more components shall be provided as a unit by the responsible manufacturer. Unless otherwise indicated, the CONTRACTOR shall obtain each system from the supplier of the driven equipment, which supplier shall provide all components of the system to enhance compatibility, ease of construction, and efficient system performance and maintenance. The CONTRACTOR shall be responsible to the City for performance of all systems as indicated.

PART 2 - PRODUCTS

2.1 RADIO/TELEMETRY SYSTEM AND COMPONENTS

A. The Radio System at the pump station shall be capable of interfacing to the PLC and processing the data for transmission via the antenna system to the Master Radio located at the nearest mountain top. CONTRACTOR shall install the radio equipment in the PLC/control cabinet at the pump station. The radio equipment and accessories shall be mounted on a single panel supplied by the manufacturer and the CONTRACTOR shall install this panel inside the control cabinet.

B. CONTRACTOR shall provide and install all necessary cables and connections from the radio equipment to the PLC interface. Proper power supply shall be provided. CONTRACTOR shall provide and install all cables and connections required for connecting the radio with the antenna.

C. The component schedule lists for the required radio/antenna equipment shall be as shown on the plans. CONTRACTOR shall verify the exact quantity required based on the specific project requirements

D. Radio modem shall be city standard SD09MD-CES-NMSNN

E. The antenna shall be city standard KATHREIN yagi TY 900 no substitutions.

PART 3 - EXECUTION

3.1 GENERAL

A. All analog instruments shall be installed so that taps and parts, etc., are available for in-place calibration and test without removal. They shall be field calibrated and tested. Installation testing shall provide the verification of contract requirements and pertinent manufacturer published performance specifications for performance parameters essential to the proper operation of the system. However, should the proper operation of any instrument be considered suspect by the City, the CONTRACTOR shall provide for the implementation of all tests required to verify proper performance.

B. Elements such as controllers, electronic function modules, etc., shall be tested and exercised to demonstrate correct operation, first individually and then collectively as functional analog networks. Each analog system shall be tested to verify proper performance. Individual component uncertainty requirements shall be as specified by the Manufacturer.

C. Field instruments shall be mounted on 2-inch pipe stands unless shown adjacent to a wall or otherwise noted. Instruments attached directly to concrete shall be spaced out from the mounting surface no less than 1/2-inch by use of phenolic spacers or framing channel. Expansion shields or cast-in-place inserts shall be used for securing equipment or supports to concrete surfaces. Unless otherwise noted, field instruments shall be mounted between 48 and 60 inches above the floor or work platform.

D. Control panels shall be mounted as shown and shall be accurately leveled to ensure that panel structure is not distorted. The panel shall be installed so as to clean all obstructions and provide ample working space in front of it.

END OF SECTION

SECTION 16750
VOICE AND DATA (TELECOMMUNICATIONS) CABLING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes wire, cable, connecting devices, installation, and testing for wiring systems to be used as signal pathways for voice and high-speed data transmission. Provide labor and material for a complete cabling system as described in the contract documents. The cabling system is to be a turnkey system, ready for use, and requiring no further installation work, except as specified.

B. Work Included:
   1. Performance of this job may include, but is not limited to:
      a. Furnish and install specified fiber optic entrance, building backbone and horizontal cables.
      b. Furnish and install all terminations as required, including: connectors, couplers, punch down blocks, patch panels, jacks, etc.
      c. Furnish and install all required termination hardware, including: 'D' rings, relay racks, ladder racking, cable clamps, faceplates, wire management panels, etc.
      d. Furnish and install all required splicing hardware, including: splice cases, connector modules, splices, end plates, etc.

1.2 RELATED DOCUMENTS

A. Underwriters Laboratories Specifications, UL13, UL444 and UL969.

B. NFPA 70, National Electrical Code (NEC) Chapter 8 – Communications Systems.

C. NFPA 75, Standard for the Protection of Electronic Computer/Data Processing Equipment.

D. NFPA 76, Recommended Practice for the Fire Protection of Telecommunications Facilities.

E. NFPA 101, Life Safety Code.

F. California Electric Code (CEC).

G. ANSI/TIA/EIA -568-B, Commercial Building Telecommunications Cabling Standard.

H. ANSI/TIA/EIA-569-B, Commercial Building Standard for Telecommunications Pathways and Spaces.

I. ANSI/TIA/EIA-606-A Administration Standard for the Telecommunications Infrastructure of Commercial Building.

J. ANSI J-STD-607-A Commercial Building Grounding and Bonding Requirements for Telecommunications.

K. ANSI/TIA/EIA-455 Fiber Optic Test Standards.

L. ANSI/TIA/EIA-526 Optical Fiber System Test Procedures.

M. ANSI/TIA/EIA-758-1 Customer Owned Outside Plant Standard Addendum 1 – OSP Optical Fiber Cabling Practices.

N. IEEE802.3ab Institute of Electrical and Electronics Engineers Standards for Gigabit Ethernet

1.3 SUBMITTALS

A. Furnish the following information and submit it as part of your submittal package:
   1. Manufacturers catalog cut sheets and product data sheets for each item listed in PART 2 – PRODUCTS indicating the part number.
   2. Data sheets for the fiber cables which include cable breakout information.
   3. A copy of the level 6 cable termination practices to which contractor will adhere.

B. A list of any companies to which work will be subcontracted, together with a description of the work they will be carrying out. Describe the proportion of the total telecommunications work that will be performed by each subcontracting company.

C. Submit as-built drawings to Resident Engineer, as specified in Part 3, within five working days of the completion of the job (or 4 weeks before building occupancy).

D. Product Certificates: Hard copies for each type of cable, connector, and terminal device, signed by product manufacturer.

E. Qualification Data: For Installation Contractor
   1. At least 3 references for telecommunications cabling jobs already completed, involving both fiber optics and twisted pair cabling, similar in scope to the project described herein. Include, for each customer reference, the following information: Company name, address, phone number, name and email address of contact and type of job completed.

F. Field quality-control test reports as specified in Part 3.

1.4 QUALITY ASSURANCE

A. Manufacturers' Qualifications: Firms regularly engaged in the manufacture of telephone and data communications system cables and components.

B. Contractors' Qualifications:
   1. Contractor and their personnel regularly engaged in the installation of telephone, video and data communications systems of a similar type, scope, size and complexity.
   2. Contractor must have a service facility within a 50-mile radius of the location of the project. The installer must be able to respond to call outs in four hours or less.

C. It is the sole responsibility of the contractor to insure full compliance with the California Prevailing Wage Rate Law as identified for the County of San Diego in all applicable categories.

D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction (AHJ), and marked for intended use.

E. Comply with the current version of NFPA 70, National Electric Code (NEC).

1.5 COORDINATION

A. All cables and innerducts are to be placed according to this document and the telecommunications cabling drawings. Coordinate and verify in field, splice points and terminations (patch panels, punch down blocks, connectors, backboards, etc.), with the Resident Engineer prior to start of work.

B. The contractor is responsible for identifying any problems or discrepancies in the specifications or drawings in advance and for bringing them to the attention of the Resident Engineer.

C. Record agreements reached in meetings or in the field and distribute to all participants.

1.6 WARRANTY

A. Provide a minimum one-year warranty on all labor and materials. The installer must be able to respond to call outs in four hours or less.

PART 2 - PRODUCTS

2.1 SYSTEM REQUIEMENTS

A. General: Coordinate the features of materials and equipment so they form an integrated system. Match components and interconnections for optimum future performance.

B. Expansion Capability: Unless otherwise indicated, provide spare positions in copper and fiber patch panels to accommodate 20 percent future increase. Provide terminal backboards and terminal blocks as required, allowing for a minimum of 50 percent future growth.

2.2 MOUNTING ELEMENTS

A. Raceways and Boxes: Comply with Section 16050, *Basic Electrical Materials and Methods.*

2.3 FIBER CABLE AND TERMINATION HARDWARE

A. All cables shall comply with U.L. and CEC requirements.

B. The following minimum requirements are for all "dual-window" fiber optic cables listed in this section:
   1. Multimode fiber specifications:
      a. All glass, graded index fiber
      b. Core/cladding: 62.5/125μm
      c. Numerical aperture: 0.275
      d. Modal bandwidth:
         1) 200 MHz•km at 850 nm
         2) 500 MHz•km at 1300 nm
      e. Maximum Attenuation:
         1) 3.5 dB/km at 850 nm
         2) 1.5 dB/km at 1300 nm
   2. Single mode fiber specifications:
      a. All glass, graded index fiber
      b. Core/cladding:
         1) 8.3/125μm
   3. Maximum Attenuation:
         1) Outside cable: 0.5 dB/km at 1310 nm, 0.3 dB/km and 1550 nm.
         2) Inside cable: 1.0 dB/km at 1310nm and 1550 nm.

C. Fiber Entrance Cables:
   1. These cables shall be composite cables, comprised of 24 strands of multimode fiber. The cables shall be of loosely buffered, gel filled construction.

D. Fiber Horizontal Cables:
   1. These cables shall be multimode fiber cables, comprised of 12 strands of multimode fiber cable. The cables shall be tight buffered, air-core, and rated CMR or CMP, according to the environment in which the cables are placed.

E. Fiber Patch Panels Shall Be AMP with part numbers as follows, to match existing City systems.
   1. Rack Mounted:
      a. 72-port patch panel 559552-2
      b. 48-port patch panel 559614-2
      c. 24-port patch panel 559542-2
   2. Wall mounted:
      a. 24-port patch panel 559561-2
      b. 12 port patch panel 559560-2
   3. Adapter Plates
      a. Multimode 6 port, ST-style, snap-in 559557-1

b. Single mode 6 port, ST-style, snap-in 559515-2

F. Fiber Optic Connectors:
1. ST couplers and connectors shall be utilized in all cases.
   a. Multimode connectors: 3M Hot Melt, p/n 6100.
   b. Single mode connectors: 3M Hot Melt, p/n 8100-YS.
2. Insertion loss for a mated pair of connectors shall not be more than 0.75 dB.

G. Innerducts:
1. 1¼" corrugated, pre-lubricated, and orange in color.

H. Warning tags:
1. Panduit, p/n PST-FO

2.4 TWISTED PAIR CABLING AND TERMINATION HARDWARE

A. All cables shall comply with ANSI EIA/TIA-568-B standard, ICEA specifications, U.L. and CEC requirements.

B. Twisted Pair Backbone cables:
1. Backbone cables shall be telephone type, 24 gauge, 25 twisted pairs, level 3, CMR type cables.
2. Auxiliary backbone cables shall be data type, 24 gauge 25 twisted pairs, level 5E, CMR type cables.

C. Twisted Pair Horizontal cables shall be 4 pair, UTP, UL Level 6, type CMR or CMP, depending upon the environment in which the cables are placed, with performance characteristics that meet or exceed TIA/EIA-568-B.2-1 Category 6 requirements.

D. Faceplate/Jacks:
Outlets shall be AMP with part numbers as follows, to match existing City systems..

a.	Single gang, 2 port faceplate	569084-X
b.	Single gang, 4 port face plate	569086-X
c.	Single gang, 6 port face plate	569088-X
d.	Four port four duplex mounting strap	1339120-X
e.	Category 6 RJ45 Module	1375055-X
f.	Strain Relief (Cat 6)	1375200-X
g.	"F" Connector module	406344-X
h.	Blank Insert	1116412-X

Patch Panels shall be AMP with part numbers as follows, to match existing City systems.

a.	89B Bracket Mount12 Port Patch Panel Cat6	1375013-1
b.	Rack Mount 24 port Patch Panel Cat6	1375014-1
c.	Rack Mount 48 port Patch Panel Cat6	1375015-1
d.	Rack Mount 96 port Patch Panel Cat6	1375016-1
e.	Cable support bars 5" deep	557548-1
f.	Rack Mount 24 port Patch Panel Cat3	557403-1
g.	Rack Mount 48 port Patch Panel Cat3	557411-1
h.	Rack Mount 96 port Patch Panel Cat3	557415-1

E. Copper Splice Cases:
OSP: Stainless steel, Preformed Line Products, Inc.
1. ISP: Dexter/Hysol, Series BC, butt splice covers
Splice modules: 3M, p/n 4000D.
2. Building Entrance protectors:
Protectors: Corning, p/n C377-004XXU.
3. Modules: Corning, p/n 4BIE-W
Cable Bending Shoe: Cordux International, p/n 08042100

F. Blocks: Siemon, Category 5E, p/n S66M1-50

G. "D" Rings: Graybar metal p/n GB13C

H. Conduit sealant: SEMCO, p/n PR821 or PR855

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine pathway elements intended for cables. Check raceways, conduits, and other elements for compliance with space allocations, installation tolerances, hazards to cable installation, and other conditions affecting installation. Proceed with installation only after unsatisfactory conditions have been corrected.

B. It is the contractor's responsibilities to:
1. Field verify the actual cable lengths required prior to bidding.
2. Verify the actual lengths using true-tape prior to placing an order for the cables.
3. Provide a complete cabling system.

3.2 GENERAL INSTALLATION REQUIREMENTS

A. Install cables using techniques, practices, and methods that are consistent with Category 6 rating of components and that ensure Category 6 performance of completed and linked signal paths, end to end.

B. Install cables without damaging conductors, shield, or jacket.

C. Do not bend cables, in handling or in installing, to smaller radii than minimum recommended by manufacturer.

D. Pull cables without exceeding cable manufacturer's recommended pulling tensions.
1. Pull cables simultaneously if more than one is being installed in same raceway.
2. Use pulling compound or lubricant if necessary. Use compounds that will not damage conductor or insulation.
3. Use pulling means, including fish tape, cable, rope, and basket-weave wire or cable grips, that will not damage media or raceway.

E. Secure and support cables at intervals not exceeding 30 inches and not more than six inches from cabinets, boxes, fittings, outlets, racks, frames, and terminals.

F. Separation of Wires: Comply with ANSI/TIA/EIA-569-B rules for separating unshielded telecommunication cabling from potential EMI sources, including electrical power lines and equipment.

G. Provide plenum rated cables (including: station, coaxial, risers, fiber and inner duct) in plenum rated areas indicated on the drawings in compliance with NEC.

H. Provide firestopping for all penetrations through fire-rated elements in accordance with the NEC and NFPA-101. Use firestop materials and systems approved by the City.

I. The conduit fill on penetrations or cable trays into telecom rooms, or through fire-rated walls, shall be kept @ 35%- 40% (maximum) fill. If the fill ratio cannot be met with the projects designed amount of conduits (leaving one open for future use), then add additional sleeves to meet this criteria.

J. Provide a 3/8" pull rope in each conduit that is used for placing entrance/riser cables or inner duct. The rope is intended to be used for future cable pulls, and thus shall not be twisted around cables as it is pulled in. The rope must have a minimum of 200 lbs tensile pull strength.

K. All cables and splices shall be racked securely and neatly.

L. Where the power receptacles on the electrical drawings are indicated to require weather proof outlet boxes or stainless steel faceplates, the telecommunications outlets in that area shall require the same type of box or faceplate. In the weather proof outlets, the RJ-45 inserts shall be mounted in a four port duplex mounting strap (AMP part # 1339120-X).

M. Telecommunications outlets installed in surface mounted metallic raceway or in floor monuments shall be mounted in a single gang four port duplex mounting strap (AMP p/n 1339120-X).

N. Upon completion of the day's work, splice openings shall be properly secured from water or other damage, until permanently closed.

O. All work shall be performed in a safe and orderly manner. All debris, trash, leftover materials etc., shall be cleaned out of terminal rooms and the general work areas before leaving the job site each day.

P. Any damage by the contractor to existing telecommunications facilities and equipment, cables, innerducts and to other existing building structures including walls, ceiling tiles, water pipes etc., shall be repaired by the contractor at no additional cost to the City. Notify the Resident Engineer immediately in case of such an event. Problems affecting normal operation that occur in the new cables shall be corrected by the contractor, at no cost to the City, prior to final acceptance by the City.

Q. All outlet boxes and faceplates shall be installed vertically with the individual jacks at the bottom unless noted otherwise.

R. Conduits shall be utilized for all entrance, backbone and horizontal cables as indicated in the contract documents and in the drawings.

S. Horizontal cabling shall be run through conduit as indicated in the contract documents. Use appropriate Velcro tywraps to bundle station cables together.

T. Conduit space is at a premium, and is to be conserved to the maximum extent possible. Vacant conduits are to be used only when others are full.

U. Terminate all cables at both ends with the designated connections.

V. Remove all abandoned cables per NEC requirements.

3.3 GROUNDING

A. Provide proper grounding, bonding and electrical protection. Ensure compliance with NEC and ANSI J-STD-607-A.

B. Bond all racks and cable trays to the telecom bus bar using at ANSI J-STD-607-A recommended AWG stranded copper bonding conductor.

3.4 IDENTIFICATION AND LABELING

A. System: The numbering scheme shall be as follows: TERMINAL #

B. Workstation: Label cables within outlet boxes.

C. Within Connector Fields in TERs, and TRs: Label each connector and each discrete unit of cable-terminating and connecting hardware.

D. Cables, General: Label each cable within four inches of each termination, where it is accessible in a cabinet or junction or outlet box, and elsewhere as indicated.

E. The topside of each faceplate shall be neatly marked with its jack number. Label each module as "A", "B", "C" or "D", starting at the top left, going top to bottom.

F. Cable Schedule: Post in a prominent location in the Electrical Room. Indicate Terminal name with incoming and outgoing cables (with their origination, destination and cable counts). The schedule shall be laminated for protection.

G. Utilize a label maker for all labeling. Use an appropriate label maker such as P-touch model PT-110. Hand written labels are not acceptable except on punch blocks.

H. Label fiber patch panels with cable name and destination.

I. Label punch down blocks with cable names, and label the tip side of every fifth pair of entrance and or backbone cables on the fanning strip.

3.5 FIBER CABLE INSTALLATION REQUIREMENTS

A. Place innerducts as required for the installation of all fiber optic cables.

B. No splices are allowed.

C. Observe all manufacturers recommendations with respect to fiber installation, especially minimum bend radius and maximum pulling stress. Terminate all fibers according to the instructions listed per cable type below. Any buffer tube that has one or more fibers terminated shall have all of the fibers in that tube terminated. Install ST connectors on the multimode and single mode fibers. Equip the patch panels with appropriate couplers, 1 per terminated fiber.

3.6 FIBER OPTIC ENTRANCE CABLES

A. Furnish and install the Fiber Entrance cables according to the drawings.

B. Test all cables as specified in Part 3.11, "TESTING".

3.7 FIBER OPTIC HORIZONTAL CABLES

A. Furnish and install Horizontal cables according to the drawings.

B. Terminate the cable at both ends.

C. Test all cables as specified in Part 3.11, "TESTING".

3.8 TWISTED PAIR HORIZONTAL CABLES

A. All horizontal cabling and patch panels shall be installed to comply with ANSI/TIA/EIA 568-B, ANSI/TIA/EIA-569-B and ANSI/NECA/BICSI 568-2001. Observe all manufacturers recommendations with respect to Category 6 UTP cable installation, especially minimum bend radius and maximum pulling stress.

B. Furnish and install telecom outlets as indicated by the drawings.

C. All horizontal cables shall be home runs to the patch panel, except where specified otherwise. They may not be spliced.

D. All horizontal cables shall be run through conduits where provided.

E. The length of any horizontal cable from patch panels in the serving Electrical Room to the telecommunications outlets (TOs) shall not exceed 295 feet (90 meters). Notify the Resident Engineer if this requirement cannot be met.

F. Test all cables as specified in Part 3.11, "TESTING".

3.9 INNERDUCT

A. A pull string (jet line or equivalent) shall be placed in each innerduct along with fiber cables.

B. Innerducts shall be continuous for the length of each fiber cable. The Resident Engineer must approve exceptions.
   1. Splicing of the innerducts shall only occur in accessible spaces (i.e.: manholes, cable trays, etc.). It may not occur within conduits.
   2. Splices shall use manufacturer-approved devices. Tape, split duct, tywraps, and connectors meant for PVC pipe, etc. are not acceptable.

C. Innerducts shall be marked with warning tags in all spaces, rooms, cable trays, manholes etc.

D. The labels shall appear at intervals of no more than fifteen feet. In no case shall less than two tags be placed in any one space.

3.10 AS-BUILTS

A. Submit three complete set of as-built drawings to Resident Engineer 4 weeks before building occupancy. Drawings shall be rendered in a neat and legible manner by a competent draftsperson, and shall include:
   1. Building floor plans showing all telecommunication outlets (with identification) and cable pathways for all installed cabling. Show labels for telecommunication closets per the project documents.

B. As-built documents shall indicate actual as-built conditions for the complete telecommunications cabling system, and shall include:
   1. Beginning and end footage markers from each fiber, coax and twisted pair entrance cable, after placement, termination and testing.

C. Provide in AutoCAD format one electronic copy of all drawings on disk.

3.11 TESTING

A. Submit one electronic copy for each of the following; fiber optic test report (attachment "A") showing the decibel loss for both the OTDR and power meter, individual fiber OTDR tests, fiber power meter tests, and Category 6 cable tests on disk.

B. Submit one hard copy (printout) of the fiber optic test report (attachment "A") showing the decibel loss for both the OTDR and power meter, individual fiber OTDR traces, twisted pair entrance and riser cables, and coaxial horizontal cable tests in a binder format.

C. Submit all test materials to the City within five working days of completion of tests.

D. Remove malfunctioning units, replace with new units, and retest as specified. Repair any other defects.

E. Fiber Optic Entrance and Horizontal cables:
   1. Test all "dual-window" fiber cables at both "windows". The wavelengths are 850 and 1300 nm for multimode and 1310 and 1550 nm for single mode cables.
   2. Terminated fibers: OTDR test in one direction and power meter test in the opposite direction.
   3. Unterminated fibers: OTDR test in both directions.
   4. Test through all installed components, including splices, jumpers, connectors and bulkhead couplers, where supplied.

F. Twisted Pair Horizontal cables:
   1. Test all cable pairs for opens, shorts, grounds and transpositions. Repair all defects.
   2. Perform Category 6 Link Performance/Certification Test on all installed cable links (station jack to patch panel), for conformance with ANSI/TIA/EIA-568-B *Telecommunications Wiring Standards* and 1000Base-T (IEEE802.3ab) Gigabit Ethernet standard. The test instruments shall be capable of performing Category 6 testing.
   3. Two weeks prior to testing, provide the make and model of the test equipment.
   4. The submitted test report will include, as a minimum, the following:
      a. Make and model of the test equipment.
      b. Test date.
      c. Test configuration and names(s) of tests performed.
      d. Jack number.
      e. Certification (pass/fail) that the link complies with ANSI/TIA/EIA-568-B.

Fiber Test Report Form

Company:	Technician:		Date:
Project name:	Cable name:	UCSD Project Manager:	
Cable Manufacturer:	Qty of fibers:	Qty singlemode:	Qty multimode:
Bldg. A:	Room:	Terminal:	Footage marker:
Bldg. B:	Room:	Terminal:	Footage marker:
Connector type:	Buffer type:	Cable name:	Final cut length:

All fibers are to be tested at 850 & 1300 nm for multimode and 1310 & 1500 nm for singlemode cables.

Buffer Color/ sm or mm	Strand num./color	unterminated fibers OTDR db loss/km (A) / (B)	terminated fibers OTDR db loss/km (A)	terminated fibers Power meter db loss (B)
	1 /	/		
	2 /	/		
	3 /	/		
	4 /	/		
	5 /	/		
	6 /	/		
	7 /	/		
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69th and Mohawk Pump Station
Water WBS S-12011

Voice And Data (Telecommunications) Cabling
16750-12

Buffer color sm/mm	Strand Num./color	unterminated fibers OTDR db loss/km (A) / (B)	terminated fibers OTDR db loss/km (A)	Power meter db loss (B)
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END OF SECTION

SECTION 16900
CONTROLS AND INSTRUMENTATION

PART 1 - GENERAL

1.1 WORK OF THIS SECTION

A General:

1. This Sections provides specifications for control equipment and instrumentation. This Section specifies the functional operation of pump station controls, and necessary interfaces, but do not necessarily enumerate detailed specification for all hardware components and devices that are necessary for complete system operation. Please refer to other sections in this specification (example Section 16485, for control panels, etc.; or Section 16700 for SCADA, telemetering) as required. The Contractor shall furnish and install all required components and devices to provide complete and operable system, capable of providing the functions and meeting performance set forth in this Section.

2. Any schedules, quantities and types of controls and instrumentation listed in these specifications are for reference purpose only and actual quantities and applicable instrumentation must be identified and specified for each specific pump station project requirements.

3. Control strategy should focus on sustaining Pressure and Flow target set point via variable frequency drive (VFD) pumps with option of local or remote bypass. Control strategy target Flow & Pressure set points and or process calls for each pump shall be provided by the City. Control strategy should also consider:

    a. Power Monitoring
    b. Pump Total Runtime
    c. Total Flow Rate
    d. Total Generator Runtime
    e. VFD Interface

4. The following materials shall be furnished for the pump station controls. Section B below describes requirements for pump control systems.

    a. Section 2.1 - Annunciator Systems
    b. Section 2.2 - Programmable logic controllers and associated components
    c. Section 2.3 - Operator Interface Terminal (OIT)
    d. Section 2.4 - Current Isolators
    e Section 2.5 - Signal wiring
    f. Section 2.6 - Hand valves

1.2 RELATED SECTIONS

A. The WORK of the following Sections 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 16050 – Basic Electrical Materials and Methods
2. Section 16485 – Local Control Panels
3. Section 16700 - SCADA

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. National Electrical Code

1.4 SPECIFICATIONS AND STANDARDS

A. Except as otherwise indicated, the specifications and standards for this WORK shall include the current editions of the specifications and standards of Section 16050, and other applicable specifications and standards.

1.5 SHOP DRAWINGS AND SAMPLES

A. A sample of each type of wire and cable shall be submitted to the City. The cable samples shall be of sufficient length to determine their rating and quality. Additionally, the submittals shall comply with the provisions set forth in Section 16050 and Section 01300.

B. General:

1. Submittals for all instrumentation and control equipment provided under this project manual shall be prepared and submitted to the City. The submittal package for each individual equipment or groups of related equipment shall be complete.

2. As a condition precedent to the review of submittals required under these specifications, the Contractor shall furnish the manufacturers' statements accepting unit responsibility. The purpose of this provision is to both insure compatibility of all components specified under the specific technical specification, but, also to provide sole source responsibility for system performance and maintenance. Not withstanding these provisions, however, the Contractor is not relieved of his responsibility for the indicated portions of work. The following submittal data shall be provided for each item of equipment. Additional data specific to individual equipment sections will be listed under individual specifications on an as-needed basis.

C. Shop Drawings and Other Data:

1. Contract Drawings:

a. The drawings are generally diagrammatic unless detailed or dimensioned. The exact locations and routing or wiring, conduit and pipe shall be governed by structural conditions, physical interferences and location of terminations of equipment.

b. The Contractor shall examine the architectural, structural, mechanical, electrical and instrumentation plans and shop drawings for the equipment in order to determine the exact routing and final terminations of conduit, cables and pipes. Conduits and pipes shall be stubbed as near as possible to equipment terminals.

2. Deviations from Specifications: Should Contractor's proposed system designs deviate from the specifications; such deviation shall be documented and submitted to the City for approval. All deviations shall be stated on the submittal transmittal sheet.

3. Organization and Binding of Submittals:

a. The initial and subsequent submittals of drawings and data for review shall be organized and bound so that eventually they may be used as guides for preparing the maintenance manuals required under Part 1.5D of this Section. Therefore, the initial submittal of drawings and data, and all copies of subsequent submittals, shall be bound in standard size, 3 ring, loose-leaf, vinyl plastic hard cover binders suitable for bookshelf storage, except as noted. Binder size shall not exceed 3-inch rings.

b. Cabinet, panel and console detail drawings shall be prepared and submitted on a uniform size paper not in excess of 22 by 34 inches; these drawings shall be submitted in a roll, in order by subject, and shall neither be folded, nor bound. Other details and drawings to be bound in the 3 ring binders shall be prepared on 8-1/2 by 11-inch or on 11 by 17-inch paper.

c. The submittal shall be organized in three parts, not including preliminary administrative material such as table of contents, as follows:

Part 1 shall consist of a series of sections, one for each process control system. Each section shall be divided by a tab and shall include the material specified below.

Part 2 shall include outline dimension drawings for panels, cabinets, consoles and the like, as specified below.

Part 3 shall include data on miscellaneous parts and accessories not included in Part 1.

4. Submittal:

a. General: The Contractor shall submit to the City for review, five sets of detailed drawings and data prepared and organized by the systems organization designated at the time of bidding. These drawings and data shall be submitted as a complete package at one time within 30 calendar days of the Notice to Proceed with the Project. The content, organization and binding of this submittal shall be as specified below.

b. Data Sheets: These data sheets shall be in a standardized format and shall include the following:

(1) Component name used herein and on the drawings.

(2) Manufacturer's model number or other product designation.

(3) Project tag number.

(4) System of which the component is a part.

(5) Location or assembly at which the component is to be installed.

(6) Input and output characteristics.

(7) Scale range and units (if any) and multiplier (if any).

(8) Requirements for electric supply (if any).

(9) Requirements for air supply (if any).

(10) Materials of component parts to be in contact with, or otherwise exposed to, process media.

(11) Reference to Manufacturer's descriptive technical bulletin or brochure.

(12) Reference to other features so that all specified features are stated on the data sheet.

c. Technical Product Bulletins or Brochures: Following each data sheet, a technical product bulletin, or brochure (or clear Xerox copy thereof) shall be inserted; this shall provide amplifying technical information on the construction, characteristics, and capabilities of the component described in the related data sheet. Elaborate and extensive technical details shall not accompany these bulletins. All bulletins shall be of the most recent issue.

d. Data Sheets and Catalog Data for Accessories: Part 3 of the submittal shall consist of a series of data sheets for accessory components together with supporting catalog pages or bulletins (or clear Xerox copies thereof). These shall be arranged in a logical sequence and shall cover such items as:

(1) Control circuit devices, components and wiring.

e. Cabinets, Panels, and Consoles: Part 2 of the submittal shall include outline and dimension drawings for all enclosed assemblies including cabinets, panels, consoles and the like. These drawings shall show the arrangements of panel-mounted and internally mounted components to

scale and shall include enough other details, to clearly establish the style and overall appearance of each assembly.

D. Operation and Maintenance Manuals:

1. General:

a. Before payment of the 75 percent progress payment, the Contractor shall provide final sets of maintenance manuals. Prior to this, two sets of preliminary manuals shall be submitted to the City within 60 days after return of favorably reviewed shop drawings and data required above.

b. Following the review of the preliminary manuals, one set will be returned to the Contractor with comments. The final five (5) sets shall be prepared and submitted to the City at least 30 days prior to start-up of systems and shall reflect as-built conditions.

2. Content:

a. A set of manuals shall include all the drawings and required data and shall be organized and bound as specified for the review submittals. These drawings and data shall be supplemented with installation, connection, operating, troubleshooting, maintenance and overhaul instructions in complete detail. This shall provide the City with comprehensive information on all systems and components to enable operation, service, maintenance and repair. Exploded or other detailed views of all instruments, assemblies and accessory components shall be included together with complete parts lists and ordering instructions.

b. In addition to the requirements set forth elsewhere, the instruction manuals shall consist of at least the following:

(1) Table of contents.
(2) System block and schematic diagrams.
(3) Component schematic diagrams.
(4) Written, verbal, step-by-step operating, trouble-shooting and calibrating instructions for each of the systems and each of the components of each system.
(5) As-built electrical and control drawings.
(6) Letter from contractor that as-builts have been checked for proper indication of equipment, wiring numbers etc.
(7) Warranty contracts, warranty service information for all equipment.

1.6 QUALITY ASSURANCE

A. Acceptable Manufacturers:

1. Furnish instruments, devices and control equipment by the named manufacturers.

2. The named manufacturers have been specified to establish a City wide standard for quality and performance of the equipment supplied.

B. Verification Process:

1. At least one level of verification process shall be provided to insure consistency and to avoid mismatches. This will be for all procured equipment and designs developed for a specific project.

C. Required Documentation:

1. Control Strategy
2. Process Transmitter Certificate of Calibration
3. Instrument Parameter Sheet
4. PLC
   a. Process Program
   b. Parameter Sheet
   c. I/O Database
5. OIT Parameter
   a. Graphics
   b. Parameter
   c. I/O Database
6. Network Switch
   a. Parameter Sheet
7. Process Meters
   a. Parameter Sheet
8. Project Shop Drawings
   a. Loop Drawings
   b. Loop Validation Certificate

1.7 ENVIRONMENTAL CONDITIONS

A. The Controls and Instrumentation will be installed in a pumping station where the ambient temperatures are expected to range between 40 degrees F to 125 degrees F. Relative humidity is expected to range from 40 percent to 100 percent. In some installations, the devices will be subjected to hydrogen sulfide gas, dust, and moisture.

PART 2 - PRODUCTS

2.1 ANNUNCIATOR SYSTEMS

A. General: Alarm annunciator systems shall consist of a back lighted window display, alarm modules, flasher-audible modules and power supply. The annunciator system shall be installed in the control cabinet front panel. The location shall be at the top of the front panel. Annunciator shall be furnished with integral: "Silence", "Acknowledge", "Reset" and "Test" pushbuttons. The alarm sequence shall be as follows:

1. Alarm condition sounds the horn and causes the display to flash.

2. Depression of the "Silence" push-button shall silence the horn.

3. Depression of the "Acknowledge" push-button causes the display to change from a flashing light to steady light.

4. Depression of the "Reset" push-button turns off the steady light when the alarm condition is corrected.

5. Depression of the "Test" push-button initiates a full system test that simulates inputs and exercises the logic of each cell in each module to reveal lamp or circuit failures.

B. Alarm Modules:

1. The annunciator must be a fully expandable, modular in design, allowing any combination of alarm modules to be configured.

2. Alarm point modules shall be solid state electronic devices.

3. Each module's relay contacts shall be configured normally open to accept dry inputs.

4. The annunciator shall provide 24 VDC wetting voltage for all inputs.

5. All input and alarm logic circuits shall contain fused protective devices with blown fuse indicators.

6. All solid state logic circuits shall conform to the requirements of SAMA PMC 33.1 - Electromagnetic Susceptibility of Process Control Instrumentation in ability to resist Radio Frequency Interference (RFI) with the control panel doors open.

7. Each alarm module shall be field configurable for normally open or normally closed contact operation.

8. Alarm modules and flasher-audible modules shall be easily removable for ease of inspection and servicing.

9. Alarm logic shall be provided for all currently utilized and spare display points.

C. Alarm Display:

1. Annunciator windows shall be translucent white with black letters.

2. Annunciator cells shall be approximately 1-inch high and 3-inches wide.

3. Each window shall have two high intensity 6 volt, 1 watt lamps rated at 20,000 hours.

4. The lamps shall be wired so that the burnout of one lamp will not affect the other lamp.

5. All lamps shall be replaceable from the front of the annunciator.

D. Window Engraving:

1. Text size shall be 5/32-inch high.

2. Annunciator cells shall be capable of supporting up to three lines of text, with a maximum of 17 characters per line.

3. All windows shall be engraved according to the schedule shown on the plans.

4. All lines of characters shall be centered in the window.

5. All characters shall be engraved in the same size and line thickness all in conformance with the requirements of ISA-RP60.6 - Nameplates, Labels and Tags for Control Centers, with a recommended distance of 3 to 6 feet.

6. All characters shall be uniformly and symmetrically spaced to give a clear, easy-to-read, informative display.

E. Audible Alarm Horn:

1. Solid state tone generators shall be provided in the annunciator. The adjustable tone generator shall activate an alarm horn located in the front of the annunciator.

2. The sound shall be continuous until silenced by manual push-button operation, or shall silence automatically after an adjustable time.

3. The sound shall be adjustable between steady and fluctuating or warble.

F. Power Supply System:

1. Each annunciator shall be provided with its own dedicated power supply equipped to receive 24 VDC power.

2. The sharing of power supplies with panel power shall not be permitted.

3. Power supplies shall provide electrical isolation between power sources and annunciator circuits.

G. Retransmit Contacts:

1. All alarm inputs to the annunciator and audible relays shall have retransmit contact outputs for input to other equipment.

2. Retransmit contacts shall be field contact followers and utilize gold flashed contacts rated at 24 VDC and 0.1 Amp.

H. Push-buttons:

1. Annunciator pushbuttons shall be provided for "Alarm Acknowledge", "Silence", "Reset" and "Lamp Test" functions as indicated.

2. All pushbuttons shall be momentary manual switches that cause a change from one annunciator sequence state to another.

3. Pushbuttons shall be located integral to the annunciator to facilitate convenient operation and access while minimizing the possibility of accidental operation of other nearby pushbuttons.

4. Interlocks shall be provided which require the operation of the "Acknowledge" push-button prior to resetting alarms to avoid accidental loss of alarm indications.

I. Product and Manufacturer:

1. Model AN-3100C as manufactured by Rochester Instrument Systems.

2.2 PROGRAMMABLE LOGIC CONTROLLERS AND ASSOCIATED COMPONENTS

A. General: The programmable logic controller system (PLC) shall be capable of processing analog, discrete, pulse input/output signals with a variety of voltages and currents. The system provided shall include all components, input/output electronic cards, power supplies, communication modules and processors as required for implementing the pump station controls and communication requirements. The processor and associated modules and cables shall be housed in a suitable rack with provision for spare capacity. This rack shall be installed inside a control cabinet. Section 16700 describes the requirements for control cabinets.

B. Communication Design Requirements:

1. Contractor shall provide modem hardware compatible with the PLC supplied. This configuration shall be used as an alternate communication to Central Operations and Maintenance Center (COMC) located at Metropolitan Operations Center (MOC II), City of San Diego. This alternate communication shall be initiated upon loss of radio communication link at the pump station PLC. Refer to Section 16700 for modem communication requirements.

C. Products and Manufacturers: All PLC components shall be Schneider Electric, No Substitutions.

1. PLC-CPU 140 CPU 651 50
2. PLC-NETWORK INTERFACE NOE 771 11
3. PLC-DI DDI 353 00
4. PLC-DO DDO 353 00
5. PLC-AI ACI 040 00
6. PLC-AO ACO 020 00
7. PLC-PWR CPS 214 00

2.3 Operator Interface Terminal (OIT)

A. Contractor is responsible for programming and configuring the OIT

B. Provide a licensed copy of OIT programming software.

C. Manufacturer: Schneider Electric XBTGT5530, No Substitutions.

2.4 CURRENT ISOLATORS

A. Current isolators shall be provided wherever necessary to isolate the instrument ground bus from plant and equipment grounds. However, whenever field equipment with isolated input/output circuits is available for a particular application, they shall be used in preference to introducing an additional element in the analog loop. Isolators shall also be provided where required to increase power levels in analog loops.

2.4 SIGNAL WIRING

A. General:

Signal wire shall be #18 stranded, TFFN type, twisted shielded pair, 600 V.

2.5 HAND VALVES

A. Except where a safety would be compromised by their use, valves shall be provided at all process taps for isolation of instrumentation equipment. Isolating valves shall be appropriate (manufacturer recommendation)-inch ball valves with brass body, 316 stainless steel trim, and Teflon seats. See Section 15091.

PART 3 - EXECUTION

3.1 GENERAL

A. All analog instruments shall be installed so that taps and parts, etc., are available for in-place calibration and test without removal. They shall be field calibrated and tested. Installation testing shall provide the verification of contract requirements and pertinent manufacturer published performance specifications for performance parameters essential to the proper operation of the system. However, should the proper operation of any instrument be considered suspect by the City, the Contractor shall provide for the implementation of all tests required to verify proper performance.

B. Elements such as controllers, electronic function modules, etc., shall be tested and exercised to demonstrate correct operation, first individually and then collectively as functional analog networks. Each analog system shall be tested to verify proper performance. Individual component uncertainty requirements shall be as specified by the Manufacturer.

C. Field instruments shall be mounted on 2-inch pipe stands unless shown adjacent to a wall or otherwise noted. Instruments attached directly to concrete shall be spaced out from the mounting surface no less than 2-inch by use of phenolic spacers or framing channel. Expansion shields or cast-in-place inserts shall be used for securing equipment or supports to concrete surfaces. Unless otherwise noted, field instruments shall be mounted between 48 and 60 inches above the floor or work platform.

D. Control panels shall be mounted as shown and shall be accurately leveled to ensure that panel structure is not distorted. The panel shall be installed so as to clean all obstructions and provide ample working space in front of it.

END OF SECTION

SECTION 16950
ELECTRICAL TESTS

PART 1 -- GENERAL

1.1 WORK OF THIS SECTION

A. The Contractor shall test, commission and demonstrate that the electrical work satisfies the criteria of the CONSTRUCTION DOCUMENTS and functions as required by the CONTRACT DOCUMENTS.

B. Contractor shall provide reports containing electrical calculations listed below that shall be prepared by a Professional Electrical Engineer (PE) licensed in the State of California.

1. Short Circuit Study
2. Overcurrent Coordination Study
3. Arc-flash Hazard Analysis
4. Load flow analysis study

1.2 GENERAL

A. The Work of this Section includes furnishing the labor, equipment and power required to support the testing in other Divisions of these Specifications. Electrical testing herein, and functional testing of all power and controls not tested under Section 16900 – Control and Instrumentation shall be completed before commencement of the 14-day test required in Section 01650. This scope may require the Contractor to activate circuits, shutdown circuits, run equipment, make electrical measurements, replace blown fuses, and install temporary jumpers.

1.3 CODES

A. The Work of this Section shall comply with the current editions of the National Electrical Code as adopted by the City of San Diego.

B. NFPA 70B: Recommended Practice for Electrical Equipment Maintenance (ANSI)

C. NFPA 70E: Standard for Electrical Safety in the Workplace (ANSI)

D. IEEE Std 242: IEEE Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems

E. IEEE Std 399: IEEE Recommended Practice for Industrial and Commercial Power Systems Analysis

F. IEEE Std 1584: IEEE Guide for Performing Arc-Flash Hazard Calculations

1.4 STANDARDS

A. Except as otherwise indicated, the current editions of the following apply to the Work of this Section:

1. NETA National Electrical Testing Association
2. ICEA Insulated Cable Engineers Association

1.5 SUBMITTALS

A. Submit the following in accordance with Section 01300 – *Submittals*:

1. Certifications: Submit name and qualifications of the PE.

2. Calculations: Submit certified copies of power system studies listed below. Calculations shall include certification of compliance with specified requirements, identify deficiencies, and recommend corrective action when appropriate. Type and neatly bind Calculations to form a part of the final record. Submit power system studies in paper format and also in electronic format transmitted on a CD-ROM.

   a. Short Circuit Study
   b. Overcurrent Coordination Study
   c. Arc-flash Hazard Analysis
   d. Load flow analysis study

1.6 TESTING

A. The following test requirements are intended to supplement test and acceptance criteria that may be stated elsewhere.

1. Lighting: Switching, including remote control, as indicated. Circuitry is in accordance with panel schedules. Lighting fixtures located to minimize obstruction of illumination by mechanical equipment or building structural elements.

2. Power Instrumentation: Demonstrate that voltmeter and ammeter switches are functional. Demonstrate that meters are within catalog accuracy as installed with specific reference to kilowatt meters.

3. Demonstrate mechanical and/or electrical interlocking by attempting to subvert the intended sequence.

4. Activate ground fault tripping by operating test features provided with ground current protective systems and by injecting a known, and reasonable, current in

the ground current sensor circuit. In general, ground fault tripping should occur at a ground current equivalent to 20% of phase current. Current injection is not required of circuit 400 a or less.

5. Cable Testing: 480-V circuits shall be tested for insulation resistance with a 1000-V megohm meter. Testing shall be done after the 480-V equipment is terminated. Phase-to-phase A-B, B-C, A-C, and phase-to-ground insulation resistance tests shall be performed on each cable prior to 5-kV, 15-kV, and 25-kV cable termination at equipment but subsequent to stress cone makeup. Test results shall be submitted for review 30 days prior to plant operation and any system testing. Equipment which may be damaged during this test shall be disconnected. Perform tests with all other equipment connected to the circuit. In order to be acceptable, the cable must withstand the test high voltage without breakdown, have steady or decreasing leakage current during the high potential test, and have satisfactory comparable megger readings in each megger test. Test results shall be submitted and shall state equipment used and time of test. Cable operating at more than 2000 V shall be tested in accordance with ICEA publications S-68-61, S-61-402, S-19-81, and S-68-516. Cable testing and report submittal shall be performed by an organization sanctioned by the Manufacturer of the cable to be tested. Testing shall verify the quality of cable terminations. Test results for medium and high voltage cable shall be submitted 30 days prior to the time schedule for equipment energization.

6. Test ground interrupter (GFI) receptacles and circuit breakers for proper operation by methods sanctioned by the receptacle manufacturer.

7. A functional test and check of all electrical components is required prior to performing subsystem testing and commissioning. Compartments and equipment shall be cleaned as required by other provisions of these Specifications before commencement of functional testing. Functional testing shall comprise:

   a. Visual and physical check of cables, busswork, circuit breakers, transformers, and connections associated with all new and modified equipment.

   b. Setting of protective relays in conformance with results of the Short Circuit Study and testing of relays to assure that relays will trip at the current value and time required by the Study.

   c. Circuit breakers with adjustable time or pick-up settings for ground current, instantaneous overcurrent, short-time overcurrent, or long-time overcurrent, shall be field adjusted by a representative of the circuit breaker Manufacturer. Time and pickup setting shall correspond to the recommendations of the Short Circuit Study. Setting shall be tabulated and proven for each circuit breaker in its installed position; test results shall be certified by the testor and transmitted to the Resident Engineer.

8. Complete ground testing of all grounding electrodes prior to operating the

equipment.

B. Subsystem testing shall occur after the proper operation of alarm and status contacts has been demonstrated or otherwise accepted by the Resident Engineer and after process control devices have been adjusted as accurately as possible. It is intended that the Contractor will adjust limit switches and level switches to their operating points prior to testing and will set pressure switches, flow switches, and timing relays as dictated by operating results.

C. After initial settings have been completed, each subsystem shall be operated in the manual mode and it shall be demonstrated that operation is in compliance with the Contract Documents. Once the manual mode of operation has been proven, automatic operation shall be demonstrated to verify such items as proper start and stop sequence of pumps, proper operation of valves, and proper speed control.

D. Motor operated valves shall be tested after having been phased and tested for correct motor rotation and after travel and torque limit switches have been adjusted by a representative of the valve Manufacturer. Tests shall verify status indication, proper valve travel, and correct command control from local and remote devices.

E. Provide ground resistance tests in the presence of the Resident Engineer and submit results. Use a ground resistance meggar "Earth" tester with a maximum of 0-50 scale. Use the full of potential method or the three terminal method as described by Biddle or Neta.

F. Subsystems, in the context discussed here, shall mean individual and groups of pumps, conveyor systems, chemical feeders, air conditioning units, ventilation fans, and air compressors.

G. General: Carry out tests for individual items of materials and equipment indicated in other Sections.

1.7 COMMISSIONING

A. Commissioning during the 14-day test as specified in Section 01650, shall not be attempted until all subsystems have been found to operate satisfactorily; commissioning shall only be attempted as a function of normal plant operation in which plant process flows and levels are routine and equipment operates automatically in response to flow and level parameters or computer command, as applicable. Simulation of process parameters will be considered only upon receipt of a written request.

B. The indications of all switchboard ammeters and kilowatt meters shall be recorded every half-hour during commissioning.

PART 2 -- PRODUCTS (Not Used)

PART 3 -- EXECUTION

3.1 POWER SYSTEM STUDIES

A. The PE shall provide power system studies described below based on the installed electrical distribution system and equipment in accordance with procedures described in NETA-ATS and the referenced codes and standards.

1. Include in the study the effect of all portions of the electrical distribution system.

2. Address normal system operating configuration.

B. Final Short-Circuit Study. Perform final short circuit calculations using procedures outlined in IEEE Std 242.

1. As a minimum, calculate the short-circuit momentary and interrupting duty on the basis of maximum available fault current at each bus in the distribution system down to the following points in the low-voltage system:

a. 480 volt system where available short circuit current is less than 14,000 amperes RMS symmetrical.

b. 208 or 240 volt system where available short circuit current is less than 10,000 amperes RMS symmetrical.

C. Final Coordination Study. Perform final coordination study using procedures outlined in IEEE Std 242.

1. As a minimum, include in the coordination study all voltage classes of equipment from the utility incoming line protective device(s) down to and including each low voltage load protective rated 100 amperes and larger.

D. Arc-Flash Hazard Analysis. Perform arc-flash hazard analysis and shock hazard analyses based on the final short-circuit study and the final coordination study. Use procedures outlined in IEEE Std 1584 and NFPA 70E. Provide the following information in tabular form for the arc-flash warning labels in accordance with NFPA 70E: Standard for Electrical Safety in the Workplace (ANSI).

1. Flash hazard boundary (inches) calculated in accordance with IEEE Std 1584 or NFPA 70E.

2. Arc-flash incident energy (cal/cm2) calculated in accordance with IEEE Std 1584 or NFPA 70E.

3. Working distance (inches) selected from IEEE Std 1584 or NFPA 70E (Annex D) based on equipment type.

4. Hazard/risk category number from NFPA 70E Table 130.7(C)(9) for operations

with doors closed and covers on

5. System phase-to-phase voltage

6. Condition that exposes worker to electrical shock hazard

7. Limited Approach Boundary from NFPA 70E Table 130.2(C) based on nominal system phase-to-phase voltage.

8. Restricted Approach Boundary from NFPA 70E Table 130.2(C) based on nominal system phase-to-phase voltage.

9. Prohibited Approach Boundary from NFPA 70E Table 130.2(C) based on nominal system phase-to-phase voltage.

10. Class for insulating gloves based on system voltage (e.g. Class 00 for up to 500 volts).

11. Voltage rating for insulated or insulating tools based on system voltage (e.g. 1000 volts).

12. Equipment ID code based on Drawings and including TA number, building number, and system identifier.

13. Date that hazard analysis was performed.

14. "Served from" circuit directory information including the serving equipment ID code, location (e.g. room number), circuit number, and circuit voltage/phases/wires.

15. If applicable, "serves" circuit directory information including the served equipment ID code, location (e.g. room number), circuit number, and circuit voltage/phases/wires.

E. Load Flow Study. Perform load flow study using procedures outlined in IEEE Std 399.

END OF SECTION

SUPPLEMENTARY SPECIAL PROVISIONS

APPENDICES

APPENDIX A

FINAL MITIGATED NEGATIVE DECLARATION

City of San Diego
Development Services
(619) 446-5460

FINAL MITIGATED NEGATIVE DECLARATION
PTS No. 404973
WBS No. S-12011.02.06
SCH. N/A

SUBJECT: **69th AND MOHAWK PUMP STATION:** The project proposes to replace an existing water pump station on an approximately 0.22-acre lot at 6910 Mohawk Street with a new water pump station. Removal of the existing pump station would consist of the demolition of two existing one-story buildings and an existing asphalt and gravel parking lot, removal of existing landscaping and irrigation, and removal of existing retaining walls and fences along the north, south and west property lines. An existing wall and fence along the east property line would remain. The new pump station would consist of a new 2,573 square-foot, 19-foot tall, one-story structure, which would house an electrical room, mechanical room and six water pumps. The pump station building materials include concrete masonry unit (CMU) walls with a plaster finish, skylights, acoustical louvers, obscured glazed windows, and concrete tile roof to integrate with the surrounding neighborhood. The project would include construction of a15.5-foot tall by 28-foot long by 18-foot wide decorative CMU block wall enclosure, with a wrought iron gate and a steel tube trellis cover, to house a temporary emergency generator. A new asphalt parking area and access driveway off of Mohawk St. would be constructed, and new landscaping and irrigation would be installed as part of the new pump station. For security purposes, a combination of new 4-foot tall CMU wall with 4-foot tall perimeter wrought iron fence on top of the wall is proposed to be constructed along the site's north, west and south property lines. An approximately 8-foot diameter by 18-foot long above ground pressure surge tank would be installed as part of the project.

The project would also include the installation of 2,800 linear feet of new water pipeline and replacement and upsizing of 4,660 linear feet of existing water pipelines for a total of 7,460 linear feet of new or replaced pipelines. Approximately 6,442 linear feet of the pipeline installation/replacement would occur on El Cajon Blvd., Mohawk St, and 67th, 68th, and 69th streets near the pump station replacement site. One thousand eighteen linear feet of pipeline would be installed or replaced on College Grove Drive, approximately 2.5 miles southwest of the pump station site. The open trenching method would be used to install/replace the pipelines at a depth of 4-8 feet deep with trench widths of approximately 2-4 feet. New or replacement water lines would be located within existing paved public road right-of-way and all trenches would be backfilled and paved to match the existing paving on the affected public roads.

Applicant: City of San Diego Public Works Department – Engineering and Capital Projects, Architectural, Engineering, and Parks Division.

I. PROJECT DESCRIPTION: See attached Initial Study.

II. ENVIRONMENTAL SETTING: See attached Initial Study.

III. DETERMINATION: The City of San Diego conducted an Initial Study which determined that the proposed project could have a significant environmental affect in the following area(s):

Archaeological Resources. Subsequent revisions in the project proposal create the specific mitigation identified in Section V of this Mitigated Negative Declaration (MND). The project, as revised, now avoids or mitigates the potentially significant environmental effects previously identified, and the preparation of an Environmental Impact Report will not be required.

IV. DOCUMENTATION: The attached Initial Study documents the reasons to support the above Determination.

V. MITIGATION, MONITORING AND REPORTING PROGRAM: To ensure that site development would avoid significant environmental impacts, a Mitigation, Monitoring, and Reporting Program (MMRP) is required. Compliance with the mitigation measures shall be the responsibility of the applicant. The mitigation measures are described below.

A. GENERAL REQUIREMENTS – PART I
Plan Check Phase (prior to permit issuance)

1. Prior to the issuance of a Notice To Proceed (NTP) for a subdivision, or any construction permits, such as Demolition, Grading or Building, or beginning any construction related activity on-site, the Development Services Department (DSD) Director's Environmental Designee (ED) shall review and approve all Construction Documents (CD), (plans, specification, details, etc.) to ensure the MMRP requirements are incorporated into the design.

2. In addition, the ED shall verify that the MMRP Conditions/Notes that apply ONLY to the construction phases of this project are included VERBATIM, under the heading, "**ENVIRONMENTAL/MITIGATION REQUIREMENTS.**"

3. These notes must be shown within the first three (3) sheets of the construction documents in the format specified for engineering construction document templates as shown on the City website:
http://www.sandiego.gov/development-services/industry/standtemp.shtml

4. The **TITLE INDEX SHEET** must also show on which pages the "Environmental/Mitigation Requirements" notes are provided.

B. GENERAL REQUIREMENTS – PART II
Post Plan Check (After permit issuance/Prior to start of construction)

1. **PRE CONSTRUCTION MEETING IS REQUIRED TEN (10) WORKING DAYS PRIOR TO BEGINNING ANY WORK ON THIS PROJECT.** The PERMIT HOLDER/OWNER is responsible to arrange and perform this meeting by contacting the CITY RESIDENT ENGINEER (RE) of the Field Engineering Division and City staff from MITIGATION MONITORING COORDINATION (MMC). Attendees must also include the Permit holder's Representative(s), Job Site Superintendent and the following consultants:

Qualified Archaeologist
Qualified Native American Monitor, Viejas Band of Kumeyaay Indians

Note: Failure of all responsible Permit Holder's representatives and consultants to attend shall require an additional meeting with all parties present.

CONTACT INFORMATION:

a) The PRIMARY POINT OF CONTACT is the **RE** at the **Field Engineering Division – 858-627-3200**
b) For Clarification of ENVIRONMENTAL REQUIREMENTS, it is also required to call **RE and MMC at 858-627-3360**

2. **MMRP COMPLIANCE:** This Project, Project Tracking System (PTS) 404973, shall conform to the mitigation requirements contained in the associated Environmental Document and implemented to the satisfaction of the DSD's Environmental Designee (MMC) and the City Engineer (RE). The requirements may not be reduced or changed but may be annotated (i.e. to explain when and how compliance is being met and location of verifying proof, etc.). Additional clarifying information may also be added to other relevant plan sheets and/or specifications as appropriate (i.e., specific locations, times of monitoring, methodology, etc

Note: Permit Holder's Representatives must alert RE and MMC if there are any discrepancies in the plans or notes, or any changes due to field conditions. All conflicts must be approved by RE and MMC BEFORE the work is performed.

3. **OTHER AGENCY REQUIREMENTS:** Evidence of compliance with all other agency requirements or permits shall be submitted to the RE and MMC for review and acceptance prior to the beginning of work or within one week of the Permit Holder obtaining documentation of those permits or requirements. Evidence shall include copies of permits, letters of resolution or other documentation issued by the responsible agency.

None

4. **MONITORING EXHIBITS:** All consultants are required to submit, to RE and MMC, a monitoring exhibit on a 11x17 reduction of the appropriate construction plan, such as site plan, grading, landscape, etc., marked to clearly show the specific areas including the **LIMIT OF WORK**, scope of that discipline's work, and notes indicating when in the construction schedule that work will be performed. When necessary for clarification, a detailed methodology of how the work will be performed shall be included.

5. **OTHER SUBMITTALS AND INSPECTIONS:** The Permit Holder/Owner's representative shall submit all required documentation, verification letters, and requests for all associated inspections to the RE and MMC for approval per the following schedule:

Document Submittal/Inspection Checklist

Issue Area	*Document submittal*	*Assoc Inspection/Approvals/Notes*
General	Consultant Qualification Letters	Prior to Pre-construction Meeting
General	Consultant Const. Monitoring Exhibits	Prior to or at the Pre-Construction
Archaeology	Archaeology Reports	Archaeology site observation
MMRP		Final MMRP Inspections

C. SPECIFIC MMRP ISSUE AREA CONDITIONS/REQUIREMENTS

ARCHAEOLOGICAL RESOURCES

I. Prior to Permit Issuance or Bid Opening/Bid Award

A. Entitlements Plan Check

1. Prior to permit issuance or Bid Opening/Bid Award, whichever is applicable, the Assistant Deputy Director (ADD) Environmental designee shall verify that the requirements for Archaeological Monitoring and Native American monitoring have been noted on the applicable construction documents through the plan check process.

B. Letters of Qualification have been submitted to ADD

1. Prior to Bid Award, the applicant shall submit a letter of verification to Mitigation Monitoring Coordination (MMC) identifying the Principal Investigator (PI) for the project and the names of all persons involved in the archaeological monitoring program, as defined in the City of San Diego Historical Resources Guidelines (HRG). If applicable, individuals involved in the archaeological monitoring program must have completed the 40-hour HAZWOPER training with certification documentation.
2. MMC will provide a letter to the applicant confirming the qualifications of the PI and all persons involved in the archaeological monitoring of the project meet the qualifications established in the HRG.
3. Prior to the start of work, the applicant must obtain written approval from MMC for any personnel changes associated with the monitoring program.

II. Prior to Start of Construction

A. Verification of Records Search

1. The PI shall provide verification to MMC that a site specific records search (1/4 mile radius) has been completed. Verification includes, but is not limited to a copy of a confirmation letter from South Coastal Information Center, or, if the search was in-house, a letter of verification from the PI stating that the search was completed.
2. The letter shall introduce any pertinent information concerning expectations and probabilities of discovery during trenching and/or grading activities.
3. The PI may submit a detailed letter to MMC requesting a reduction to the ¼ mile radius.

B. PI Shall Attend Precon Meetings

1. Prior to beginning any work that requires monitoring; the Applicant shall arrange a Precon Meeting that shall include the PI, Native American consultant/monitor (where Native American resources may be impacted), Construction Manager (CM) and/or Grading Contractor, Resident Engineer (RE), Building Inspector (BI), if appropriate, and MMC. The qualified Archaeologist and Native American Monitor shall attend any grading/excavation related Precon Meetings to make comments and/or suggestions concerning the Archaeological Monitoring program with the Construction Manager and/or Grading Contractor.
   a. If the PI is unable to attend the Precon Meeting, the Applicant shall schedule a focused Precon Meeting with MMC, the PI, RE, CM or BI, if appropriate, prior to the start of any work that requires monitoring.

2. Acknowledgement of Responsibility for Curation (CIP or Other Public Projects)

The applicant shall submit a letter to MMC acknowledging their responsibility for the cost of curation associated with all phases of the archaeological monitoring program.

3. Identify Areas to be Monitored
   a. Prior to the start of any work that requires monitoring, the PI shall submit an Archaeological Monitoring Exhibit (AME) (with verification that the AME has been reviewed and approved by the Native American consultant/monitor when Native American resources may be impacted) based on the appropriate construction documents (reduced to 11x17) to MMC identifying the areas to be monitored including the delineation of grading/excavation limits.
   b. The AME shall be based on the results of a site specific records search as well as information regarding the age of existing pipelines, laterals and associated appurtenances and/or any known soil conditions (native or formation).
   c. MMC shall notify the PI that the AME has been approved.
4. When Monitoring Will Occur
   a. Prior to the start of any work, the PI shall also submit a construction schedule to MMC through the RE indicating when and where monitoring will occur.
   b. The PI may submit a detailed letter to MMC prior to the start of work or during construction requesting a modification to the monitoring program. This request shall be based on relevant information such as review of final construction documents which indicate conditions such as age of existing pipe to be replaced, depth of excavation and/or site graded to bedrock, etc., which may reduce or increase the potential for resources to be present.
5. Approval of AME and Construction Schedule
   After approval of the AME by MMC, the PI shall submit to MMC written authorization of the AME and Construction Schedule from the CM.

III. During Construction

A. Monitor Shall be Present During Grading/Excavation/Trenching

1. The Archaeological Monitor shall be present full-time during all soil disturbing and grading/excavation/trenching activities which could result in impacts to archaeological resources as identified on the AME. **The Construction Manager is responsible for notifying the RE, PI, and MMC of changes to any construction activities such as in the case of a potential safety concern within the area being monitored. In certain circumstances OSHA safety requirements may necessitate modification of the AME.**
2. The Native American consultant/monitor shall determine the extent of their presence during soil disturbing and grading/excavation/trenching activities based on the AME and provide that information to the PI and MMC. If prehistoric resources are encountered during the Native American consultant/monitor's absence, work shall stop and the Discovery Notification Process detailed in Section III.B-C and IV.A-D shall commence.
3. The PI may submit a detailed letter to MMC during construction requesting a modification to the monitoring program when a field condition such as modern disturbance post-dating the previous grading/trenching activities, presence of fossil formations, or when native soils are encountered that may reduce or increase the potential for resources to be present.
4. The archaeological and Native American consultant/monitor shall document field activity via the Consultant Site Visit Record (CSVR). The CSVR's shall be faxed by the CM to the RE the first day of monitoring, the last day of monitoring, monthly **(Notification of Monitoring Completion)**, and in the case of ANY discoveries. The RE shall forward copies to MMC.

B. Discovery Notification Process
   1. In the event of a discovery, the Archaeological Monitor shall direct the contractor to temporarily divert all soil disturbing activities, including but not limited to digging, trenching, excavating or grading activities in the area of discovery and in the area reasonably suspected to overlay adjacent resources and immediately notify the RE or BI, as appropriate.
   2. The Monitor shall immediately notify the PI (unless Monitor is the PI) of the discovery.
   3. The PI shall immediately notify MMC by phone of the discovery, and shall also submit written documentation to MMC within 24 hours by fax or email with photos of the resource in context, if possible.
   4. No soil shall be exported off-site until a determination can be made regarding the significance of the resource specifically if Native American resources are encountered.

C. Determination of Significance
   1. The PI and Native American consultant/monitor, where Native American resources are discovered shall evaluate the significance of the resource. If Human Remains are involved, follow protocol in Section IV below.
      a. The PI shall immediately notify MMC by phone to discuss significance determination and shall also submit a letter to MMC indicating whether additional mitigation is required.
      b. If the resource is significant, the PI shall submit an Archaeological Data Recovery Program (ADRP) and obtain written approval of the program from MMC, CM and RE. ADRP and any mitigation must be approved by MMC, RE and/or CM before ground disturbing activities in the area of discovery will be allowed to resume. **Note: If a unique archaeological site is also an historical resource as defined in CEQA Section 15064.5, then the limits on the amount(s) that a project applicant may be required to pay to cover mitigation costs as indicated in CEQA Section 21083.2 shall not apply.**
         (1). Note: For pipeline trenching and other linear projects in the public Right-of-Way, the PI shall implement the Discovery Process for Pipeline Trenching projects identified below under "D."
      c. If the resource is not significant, the PI shall submit a letter to MMC indicating that artifacts will be collected, curated, and documented in the Final Monitoring Report. The letter shall also indicate that that no further work is required.
         (1). Note: For Pipeline Trenching and other linear projects in the public Right-of-Way, if the deposit is limited in size, both in length and depth; the information value is limited and is not associated with any other resource; and there are no unique features/artifacts associated with the deposit, the discovery should be considered not significant.
         (2). Note, for Pipeline Trenching and other linear projects in the public Right-of-Way, if significance cannot be determined, the Final Monitoring Report and Site Record (DPR Form 523A/B) shall identify the discovery as Potentially Significant.

D. Discovery Process for Significant Resources - Pipeline Trenching and other Linear Projects in the Public Right-of-Way

The following procedure constitutes adequate mitigation of a significant discovery encountered during pipeline trenching activities or for other linear project types within the Public Right-of-Way including but not limited to excavation for jacking pits, receiving pits, laterals, and manholes to reduce impacts to below a level of significance:

1. Procedures for documentation, curation and reporting
   a. One hundred percent of the artifacts within the trench alignment and width shall be documented in-situ, to include photographic records, plan view of the trench and profiles of side walls, recovered, photographed after cleaning and analyzed and curated. The remainder of the deposit within the limits of excavation (trench walls) shall be left intact.
   b. The PI shall prepare a Draft Monitoring Report and submit to MMC via the RE as indicated in Section VI-A.
   c. The PI shall be responsible for recording (on the appropriate State of California Department of Park and Recreation forms-DPR 523 A/B) the resource(s) encountered during the Archaeological Monitoring Program in accordance with the City's Historical Resources Guidelines. The DPR forms shall be submitted to the South Coastal Information Center for either a Primary Record or SDI Number and included in the Final Monitoring Report.
   d. The Final Monitoring Report shall include a recommendation for monitoring of any future work in the vicinity of the resource.

IV. Discovery of Human Remains

If human remains are discovered, work shall halt in that area and no soil shall be exported off-site until a determination can be made regarding the provenance of the human remains; and the following procedures as set forth in CEQA Section 15064.5(e), the California Public Resources Code (Sec. 5097.98) and State Health and Safety Code (Sec. 7050.5) shall be undertaken:

A. Notification
   1. Archaeological Monitor shall notify the RE or BI as appropriate, MMC, and the PI, if the Monitor is not qualified as a PI. MMC will notify the appropriate Senior Planner in the Environmental Analysis Section (EAS) of the Development Services Department to assist with the discovery notification process.
   2. The PI shall notify the Medical Examiner after consultation with the RE, either in person or via telephone.

B. Isolate discovery site
   1. Work shall be directed away from the location of the discovery and any nearby area reasonably suspected to overlay adjacent human remains until a determination can be made by the Medical Examiner in consultation with the PI concerning the provenience of the remains.
   2. The Medical Examiner, in consultation with the PI, will determine the need for a field examination to determine the provenience.
   3. If a field examination is not warranted, the Medical Examiner will determine with input from the PI, if the remains are or are most likely to be of Native American origin.

C. If Human Remains **ARE** determined to be Native American
   1. The Medical Examiner will notify the Native American Heritage Commission (NAHC) within 24 hours. By law, **ONLY** the Medical Examiner can make this call.
   2. NAHC will immediately identify the person or persons determined to be the Most Likely Descendent (MLD) and provide contact information.
   3. The MLD will contact the PI within 24 hours or sooner after the Medical Examiner has completed coordination, to begin the consultation process in accordance with CEQA Section 15064.5(e), the California Public Resources and Health & Safety Codes.
   4. The MLD will have 48 hours to make recommendations to the property owner or representative, for the treatment or disposition with proper dignity, of the human remains

and associated grave goods.

5. Disposition of Native American Human Remains will be determined between the MLD and the PI, and, if:
   a. The NAHC is unable to identify the MLD, OR the MLD failed to make a recommendation within 48 hours after being notified by the Commission, OR;
   b. The landowner or authorized representative rejects the recommendation of the MLD and mediation in accordance with PRC 5097.94 (k) by the NAHC fails to provide measures acceptable to the landowner, THEN
   c. To protect these sites, the landowner shall do one or more of the following:
      (1) Record the site with the NAHC;
      (2) Record an open space or conservation easement; or
      (3) Record a document with the County.
   d. Upon the discovery of multiple Native American human remains during a ground disturbing land development activity, the landowner may agree that additional conferral with descendants is necessary to consider culturally appropriate treatment of multiple Native American human remains. Culturally appropriate treatment of such a discovery may be ascertained from review of the site utilizing cultural and archaeological standards. Where the parties are unable to agree on the appropriate treatment measures the human remains and items associated and buried with Native American human remains shall be reinterred with appropriate dignity, pursuant to Section 5.c., above.

D. If Human Remains are **NOT** Native American
   1. The PI shall contact the Medical Examiner and notify them of the historic era context of the burial.
   2. The Medical Examiner will determine the appropriate course of action with the PI and City staff (PRC 5097.98).
   3. If the remains are of historic origin, they shall be appropriately removed and conveyed to the San Diego Museum of Man for analysis. The decision for internment of the human remains shall be made in consultation with MMC, EAS, the applicant/landowner, any known descendant group, and the San Diego Museum of Man.

V. Night and/or Weekend Work

A. If night and/or weekend work is included in the contract
   1. When night and/or weekend work is included in the contract package, the extent and timing shall be presented and discussed at the precon meeting.
   2. The following procedures shall be followed.
      a. No Discoveries
         In the event that no discoveries were encountered during night and/or weekend work, the PI shall record the information on the CSVR and submit to MMC via fax by 8AM of the next business day.
      b. Discoveries
         All discoveries shall be processed and documented using the existing procedures detailed in Sections III - During Construction, and IV – Discovery of Human Remains. Discovery of human remains shall always be treated as a significant discovery.
      c. Potentially Significant Discoveries
         If the PI determines that a potentially significant discovery has been made, the procedures detailed under Section III - During Construction and IV-Discovery of Human Remains shall be followed.
      d. The PI shall immediately contact the RE and MMC, or by 8AM of the next business day to report and discuss the findings as indicated in Section III-B, unless other specific

arrangements have been made.

B. If night and/or weekend work becomes necessary during the course of construction
   1. The Construction Manager shall notify the RE, or BI, as appropriate, a minimum of 24 hours before the work is to begin.
   2. The RE, or BI, as appropriate, shall notify MMC immediately.

C. All other procedures described above shall apply, as appropriate.

VI. Post Construction

A. Submittal of Draft Monitoring Report
   1. The PI shall submit two copies of the Draft Monitoring Report (even if negative), prepared in accordance with the Historical Resources Guidelines (Appendix C/D) which describes the results, analysis, and conclusions of all phases of the Archaeological Monitoring Program (with appropriate graphics) to MMC via the RE for review and approval within 90 days following the completion of monitoring. **It should be noted that if the PI is unable to submit the Draft Monitoring Report within the allotted 90-day timeframe as a result of delays with analysis, special study results or other complex issues, a schedule shall be submitted to MMC establishing agreed due dates and the provision for submittal of monthly status reports until this measure can be met.**
      a. For significant archaeological resources encountered during monitoring, the Archaeological Data Recovery Program or Pipeline Trenching Discovery Process shall be included in the Draft Monitoring Report.
      b. Recording Sites with State of California Department of Parks and Recreation
      The PI shall be responsible for recording (on the appropriate State of California Department of Park and Recreation forms-DPR 523 A/B) any significant or potentially significant resources encountered during the Archaeological Monitoring Program in accordance with the City's Historical Resources Guidelines, and submittal of such forms to the South Coastal Information Center with the Final Monitoring Report.
   2. MMC shall return the Draft Monitoring Report to the PI via the RE for revision or, for preparation of the Final Report.
   3. The PI shall submit revised Draft Monitoring Report to MMC via the RE for approval.
   4. MMC shall provide written verification to the PI of the approved report.
   5. MMC shall notify the RE or BI, as appropriate, of receipt of all Draft Monitoring Report submittals and approvals.

B. Handling of Artifacts
   1. The PI shall be responsible for ensuring that all cultural remains collected are cleaned and catalogued
   2. The PI shall be responsible for ensuring that all artifacts are analyzed to identify function and chronology as they relate to the history of the area; that faunal material is identified as to species; and that specialty studies are completed, as appropriate.

C. Curation of artifacts: Accession Agreement and Acceptance Verification
   1. The PI shall be responsible for ensuring that all artifacts associated with the survey, testing and/or data recovery for this project are permanently curated with an appropriate institution. This shall be completed in consultation with MMC and the Native American representative, as applicable.
   2. When applicable to the situation, the PI shall include written verification from the Native American consultant/monitor indicating that Native American resources were treated in accordance with state law and/or applicable agreements. If the resources were reinterred, verification shall be provided to show what protective measures were taken to ensure no

further disturbance occurs in accordance with Section IV – Discovery of Human Remains, Subsection C.

3. The PI shall submit the Accession Agreement and catalogue record(s) to the RE or BI, as appropriate for donor signature with a copy submitted to MMC.
4. The RE or BI, as appropriate shall obtain signature on the Accession Agreement and shall return to PI with copy submitted to MMC.
5. The PI shall include the Acceptance Verification from the curation institution in the Final Monitoring Report submitted to the RE or BI and MMC.

D. Final Monitoring Report(s)

1. The PI shall submit one copy of the approved Final Monitoring Report to the RE or BI as appropriate, and one copy to MMC (even if negative), within 90 days after notification from MMC of the approved report.
2. The RE shall, in no case, issue the Notice of Completion until receiving a copy of the approved Final Monitoring Report from MMC which includes the Acceptance Verification from the curation institution.

VI. PUBLIC REVIEW DISTRIBUTION:

Draft copies or notice of this Mitigated Negative Declaration were distributed to:

City of San Diego
Councilmember Cole - District 4 (MS 10A)
Councilmember Emerald - District 9 (MS 10A)
Mayor's Office (MS 11A)

City Attorney's Office
Shannon Thomas (MS 59)

Development Services
Mark Brunette (MS 501)
Peter Kann (MS 301)

Engineering and Capital Projects
John Stohr (MS 908A)
Darren Genova (MS 908A)

Library Department
Government Documents (81)
College-Rolando Branch Library (81I)
Oak Park Branch Library (81U)

Other Groups and Individuals
College Area Community Planning Board (456)
Eastern Area Communities Planning Committee (302)
Oak Park Community Council (299)
Historical Resources Board (87)
Carmen Lucas (206)
South Coastal Information Center (210)
San Diego Archaeological Center (212)

Save Our Heritage Organisation (214)
Ron Christman (215)
Clint Linton (215B)
Frank Brown – Inter-Tribal Cultural Resources Council (216)
Campo Band of Mission Indians (217)
San Diego County Archaeological Society, Inc. (218)
Kumeyaay Cultural Heritage Preservation (223)
Kumeyaay Cultural Repatriation Committee (225)
Native American Distribution (225 A-S) (Public Notice & Location Map Only)
Native American Heritage Commission (222)

VII. RESULTS OF PUBLIC REVIEW:

( ) No comments were received during the public input period.

(X) Comments were received but did not address the draft Mitigated Negative Declaration finding or the accuracy/completeness of the Initial Study. No response is necessary. The letters are attached.

( ) Comments addressing the findings of the draft Negative Declaration and/or accuracy or completeness of the Initial Study were received during the public input period. The letters and responses follow.

Copies of the draft Mitigated Negative Declaration, and any Initial Study material are available in the office of the Entitlements Division for review, or for purchase at the cost of reproduction.

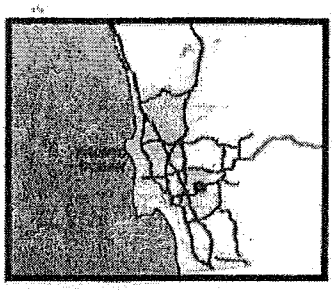
Mark Brunette, Senior Planner
Development Services Department

November 4, 2015
Date of Draft Report

December 8, 2015
Date of Final Report

Analyst: Mark Brunette

Attachments: Location Maps
Initial Study Checklist



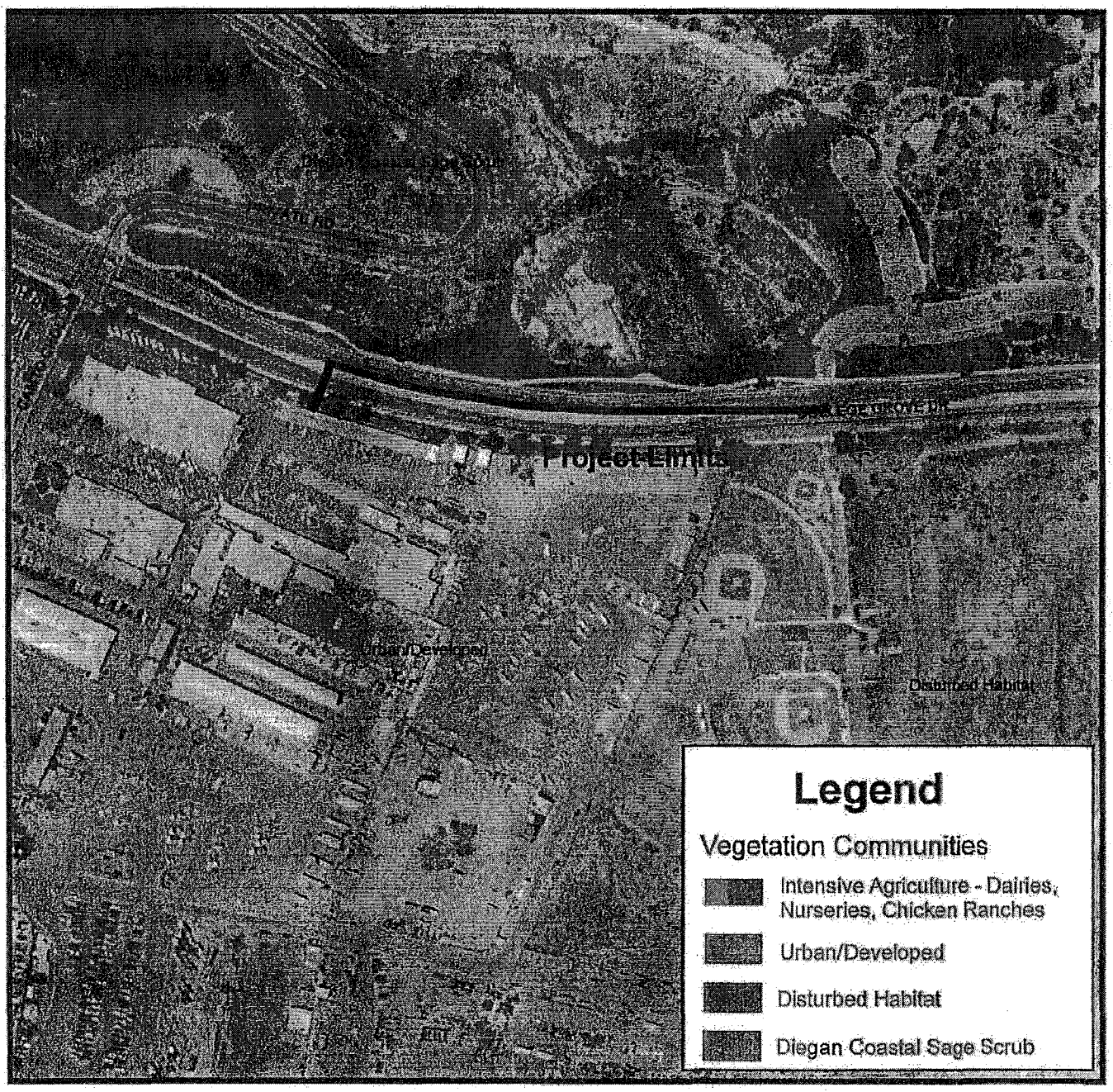
69th & Mohawk Pump Station Project (College Grove Dr. Segment)

SENIOR ENGINEER
Hossein Azar
619-533-4102

PROJECT MANAGER
John Stohr
619-533-6626

CITY OF SAN DIEGO PUBLIC WORKS DEPARTMENT

Project Implementation



Vegetation Communities

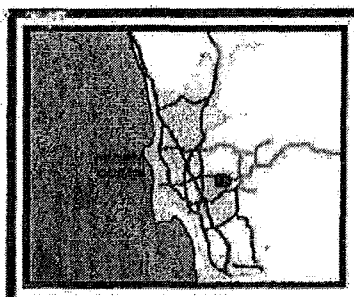
190 95 0 190 Feet

COMMUNITY NAME:
Mid-City Eastern / Oak Park

COUNCIL DISTRICT: 4

SAP ID: S-12011.02.06

Date: January 5, 2015

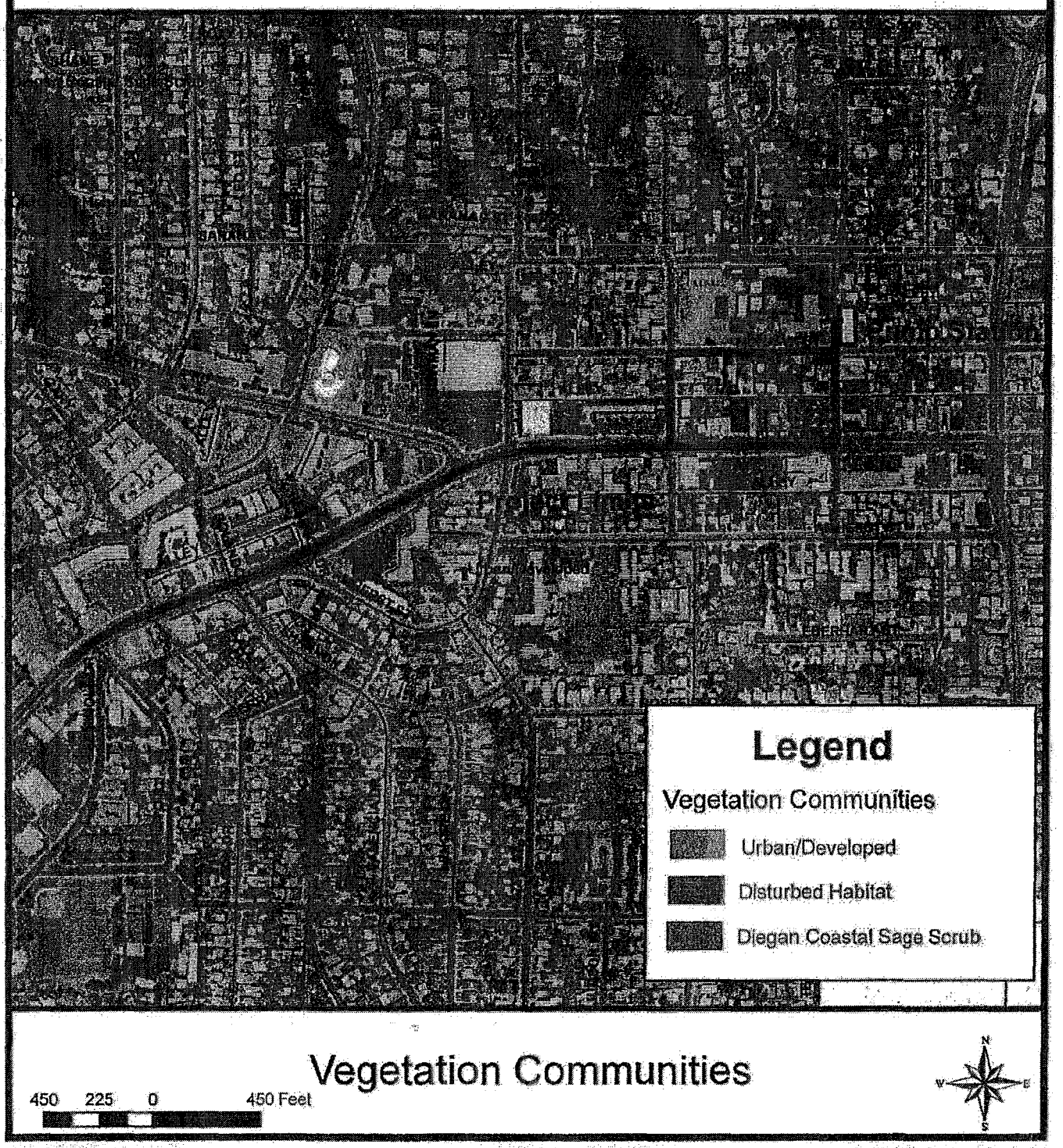


69th & Mohawk Pump Station Project (El Cajon Segment)

SENIOR ENGINEER
Hossein Azar
619-533-4102

PROJECT MANAGER
John Stohr
619-533-6626

CITY OF SAN DIEGO
PUBLIC WORKS
DEPARTMENT
Project Implementation



COMMUNITY NAME:
College Area

COUNCIL DISTRICT: 9

SAP ID: S-12011.02.06

SanGIS

Date: January 6, 2015

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 1OF 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.)

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.

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.

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.

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

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

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

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.

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. Theses 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.

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)

City of San Diego PUBLIC UTILITIES Water & Wastewater

(For Office Use Only)

NS REQ	FAC#
DATE	BY

METER SHOP (619) 527-7449

Application Date	Requested Install Date:

Meter Information

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: ☐	☐ 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: (PERSON IN ACCOUNTS PAYABLE)			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: ( )	

☐ City Meter	☐ 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

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					$ -		$ -		$ -	0.00%	$ -
	CHANGE ORDER No.				$ -		$ -		$ -	0.00%	$ -
					$ -		$ -		$ -	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

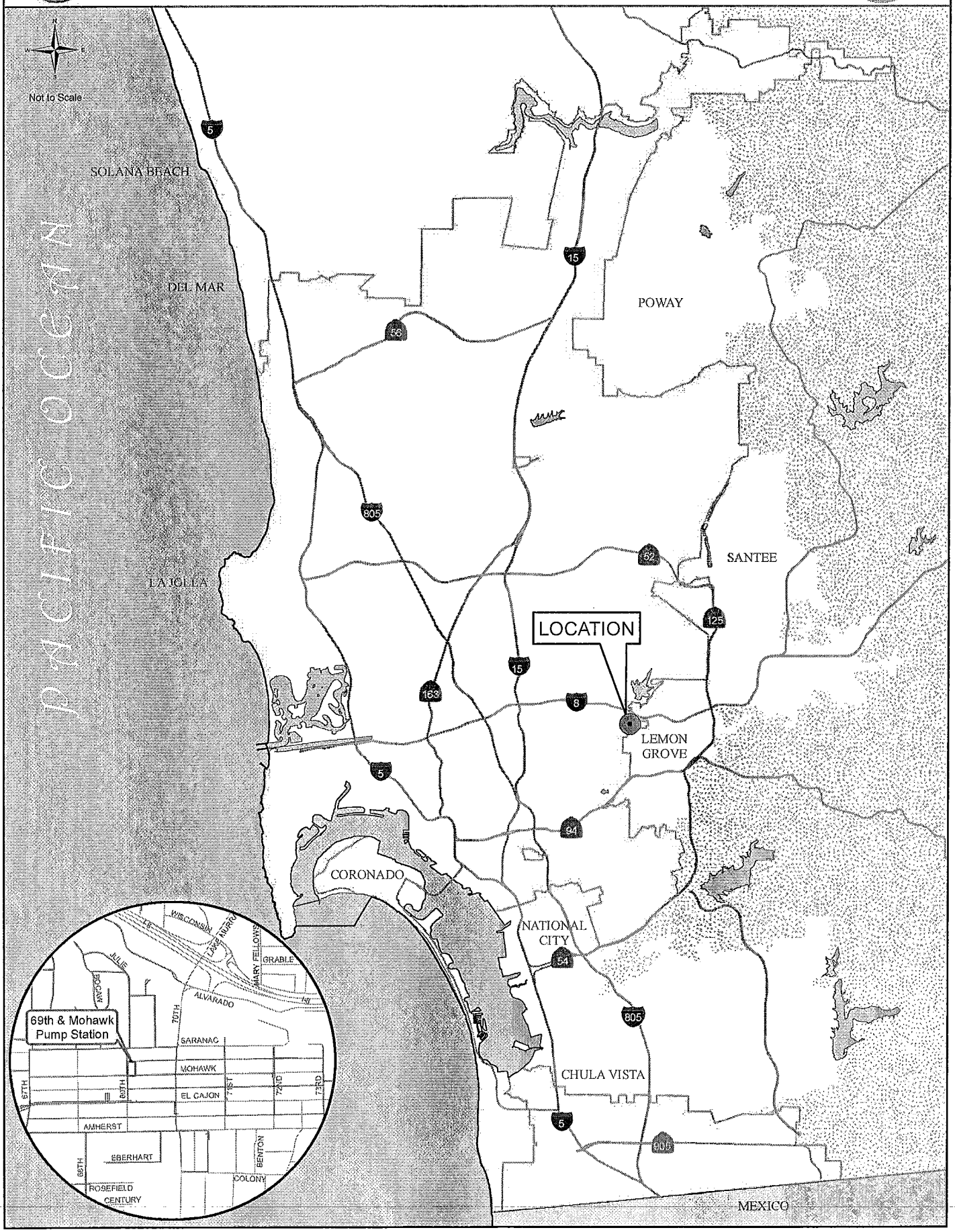
Total Retention Required as of this billing (Item E)	$0.00
Previous Retention Withheld in PO or in Escrow	$0.00
Add'l Amt to Withhold in PO/Transfer in Escrow:	***$0.00***
Amt to Release to Contractor from PO/Escrow:	

Contractor Signature and Date: _____

APPENDIX E

LOCATION MAP

69TH & MOHAWK PUMP STATION
Vicinity Map



APPENDIX F

HYDROSTATIC DISCHARGE FORM

Hydrostatic Discharge Requirements Certification (Discharge Events ≥ 325,850 gpd)

All discharge activities related to this project comply with the Regional Water Quality Control Board (RWQCB) Order No. R9-2010-0003, General Permit for Discharges of Hydrostatic Test Water and Potable Water to Surface Water and Storm Drains as referenced by (http://www.waterboards.ca.gov/sandiego/board_decisions/adopted_orders/2010/R9-2010-0003.pdf), and as follows:

Discharged water has been dechlorinated to below **0.1** *(mg/l)* level; and effluent has been maintained between **6 and 9** *(pH)* based on:

Event #	Discharge Date	Item Tested	Duration	Amount (gpd)	Description of the Proposed Discharge	Method and Test Result	*Is Discharge Within Limits?* YES	NO	Comment/Action Taken
		Chlorine							
		pH							
		Chlorine							
		pH							
		Chlorine							
		pH							
		Chlorine							
		pH							

Qualified Personnel Conducting Tests (Print Name):	***SAP No.(s):***
***Signed:**	**Project Name:**

* By signing, I hereby certify and affirm under penalty of perjury that all of the statements and conditions for hydrostatic discharge events are correct.

Have any thresholds been exceeded? Per Order No. R9-2010-0003, would this be a reportable discharge and must be reported **within 24 hours** of the event? [Reportable discharge would include violation of maximum gallons per day, any upset which exceeds any effluent limit]

APPENDIX G

HAZARDOUS FORMS/LABEL

INCIDENT/RELEASE ASSESSMENT FORM [1]

If you have an emergency, Call 911

Handlers of hazardous materials are required to report releases. The following is a tool to be used for assessing if a release is reportable. Additionally, a non-reportable release incident form is provided to document why a release is not reported (see back).

Questions for Incident Assessment:	YES	NO
1. Was anyone killed or injured, or did they require medical care or admitted to a hospital for observation?	☐	☐
2. Did anyone, other than employees in the immediate area of the release, evacuate?	☐	☐
3. Did the release cause off-site damage to public or private property?	☐	☐
4. Is the release greater than or equal to a reportable quantity (RQ)?	☐	☐
5. Was there an uncontrolled or unpermitted release to the air?	☐	☐
6. Did an uncontrolled or unpermitted release escape secondary containment, or extend into any sewers, storm water conveyance systems, utility vaults and conduits, wetlands, waterways, public roads, or off site?	☐	☐
7. Will control, containment, decontamination, and/or clean up require the assistance of federal, state, county, or municipal response elements?	☐	☐
8. Was the release or threatened release involving an unknown material or contains an unknown hazardous constituent?	☐	☐
9. Is the incident a threatened release (a condition creating a substantial probability of harm that requires immediate action to prevent, reduce, or mitigate damages to persons, property, or the environment)?	☐	☐
10. Is there an increased potential for secondary effects including fire, explosion, line rupture, equipment failure, or other outcomes that may endanger or cause exposure to employees, the general public, or the environment?	☐	☐

If the answer is YES to any of the above questions – report the release to the California Office of Emergency Services at 800-852-7550 and the local CUPA daytime: (619) 338-2284, after hours: (858) 565-5255. Note: other state and federal agencies may require notification depending on the circumstances.

Call 911 in an emergency

If all answers are NO, complete a Non Reportable Release Incident Form (page 2 of 2) and keep readily available. Documenting why a "no" response was made to each question will serve useful in the event questions are asked in the future, and to justify not reporting to an outside regulatory agency.

If in doubt, report the release.

[1] This document is a guide for accessing when hazardous materials release reporting is required by Chapter 6.95 of the California Health and Safety Code. It does not replace good judgment, Chapter 6.95, or other state or federal release reporting requirements.

NON REPORTABLE RELEASE INCIDENT FORM

1. RELEASE AND RESPONSE DESCRIPTION Incident #

Date/Time Discovered	Date/Time Discharge	Discharge Stopped ☐ Yes ☐ No
Incident Date / Time:		
Incident Business / Site Name:		
Incident Address:		
Other Locators (Bldg, Room, Oil Field, Lease, Well #, GIS)		
Please describe the incident and indicate specific causes and area affected. Photos Attached?: ☐Yes ☐ No		
Indicate actions to be taken to prevent similar releases from occurring in the future.		

2. ADMINISTRATIVE INFORMATION

Supervisor in charge at time of incident:	Phone:
Contact Person:	Phone:

3. CHEMICAL INFORMATION

Chemical	Quantity ☐ GAL ☐ LBS ☐ FT^3
Chemical	Quantity ☐ GAL ☐ LBS ☐ FT^3
Chemical	Quantity ☐ GAL ☐ LBS ☐ FT^3
Clean-Up Procedures & Timeline:	
Completed By:	Phone:
Print Name:	Title:

EMERGENCY RELEASE FOLLOW-UP NOTICE REPORTING FORM

A

BUSINESS NAME	FACILITY EMERGENCY CONTACT & PHONE NUMBER ( ) -

B

INCIDENT DATE MO DAY YR	TIME OES NOTIFIED (use 24 hr time)	OES CONTROL NO.

C

INCIDENT ADDRESS LOCATION	CITY / COMMUNITY	COUNTY ZIP

D

CHEMICAL OR TRADE NAME (print or type)	CAS Number

CHECK IF CHEMICAL IS LISTED IN 40 CFR 355, APPENDIX A ☐	CHECK IF RELEASE REQUIRES NOTIFICATION UNDER 42 U.S.C. Section 9603 (a) ☐

PHYSICAL STATE CONTAINED ☐ SOLID ☐ LIQUID ☐ GAS	PHYSICAL STATE RELEASED ☐ SOLID ☐ LIQUID ☐ GAS	QUANTITY RELEASED

ENVIRONMENTAL CONTAMINATION ☐ AIR ☐ WATER ☐ GROUND ☐ OTHER	TIME OF RELEASE	DURATION OF RELEASE ___DAYS ___HOURS ___MINUTES

E

ACTIONS TAKEN

F

KNOWN OR ANTICIPATED HEALTH EFFECTS (Use the comments section for addition information)

☐ ACUTE OR IMMEDIATE (explain) _____

☐ CHRONIC OR DELAYED (explain) _____

☐ NOT KNOWN (explain)

G

ADVICE REGARDING MEDICAL ATTENTION NECESSARY FOR EXPOSED INDIVIDUALS

H

COMMENTS (INDICATE SECTION (A - G) AND ITEM WITH COMMENTS OR ADDITIONAL INFORMATION)

I

CERTIFICATION: I certify under penalty of law that I have personally examined and I am familiar with the information submitted and believe the submitted information is true, accurate, and complete.

REPORTING FACILITY REPRESENTATIVE (print or type) _____

SIGNATURE OF REPORTING FACILITY REPRESENTATIVE _____ DATE: _____

EMERGENCY RELEASE FOLLOW-UP NOTICE
REPORTING FORM INSTRUCTIONS

GENERAL INFORMATION:

Chapter 6.95 of Division 20 of the California Health and Safety Code requires that written emergency release follow-up notices prepared pursuant to 42 U.S.C. § 11004, be submitted using this reporting form. Non-permitted releases of reportable quantities of Extremely Hazardous Substances (listed in 40 CFR 355, appendix A) or of chemicals that require release reporting under section 103(a) of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 [42 U.S.C. § 9603(a)] must be reported on the form, as soon as practicable, but no later than 30 days, following a release. The written follow-up report is required in addition to the verbal notification.

BASIC INSTRUCTIONS:

- The form, when filled out, reports follow-up information required by 42 U.S.C § 11004. Ensure that all information requested by the form is provided as completely as possible.
- If the incident involves reportable releases of more than one chemical, prepare one report form for each chemical released.
- If the incident involves a series of separate releases of chemical(s) at different times, the releases should be reported on separate reporting forms.

SPECIFIC INSTRUCTIONS:

Block A: Enter the name of the business and the name and phone number of a contact person who can provide detailed facility information concerning the release.

Block B: Enter the date of the incident and the time that verbal notification was made to OES. The OES control number is provided to the caller by OES at the time verbal notification is made. Enter this control number in the space provided.

Block C: Provide information pertaining to the location where the release occurred. Include the street address, the city or community, the county and the zip code.

Block D: Provide information concerning the specific chemical that was released. Include the chemical or trade name and the Chemical Abstract Service (CAS) number. Check all categories that apply. Provide best available information on quantity, time and duration of the release.

Block E: Indicate all actions taken to respond to and contain the release as specified in 42 U.S.C. § 11004(c).

Block F: Check the categories that apply to the health effects that occurred or could result from the release. Provide an explanation or description of the effects in the space provided. Use Block H for additional comments/information if necessary to meet requirements specified in 42 U.S.C. § 11004(c).

Block G: Include information on the type of medical attention required for exposure to the chemical released. Indicate when and how this information was made available to individuals exposed and to medical personnel, if appropriate for the incident, as specified in 42 U.S.C. § 11004(c).

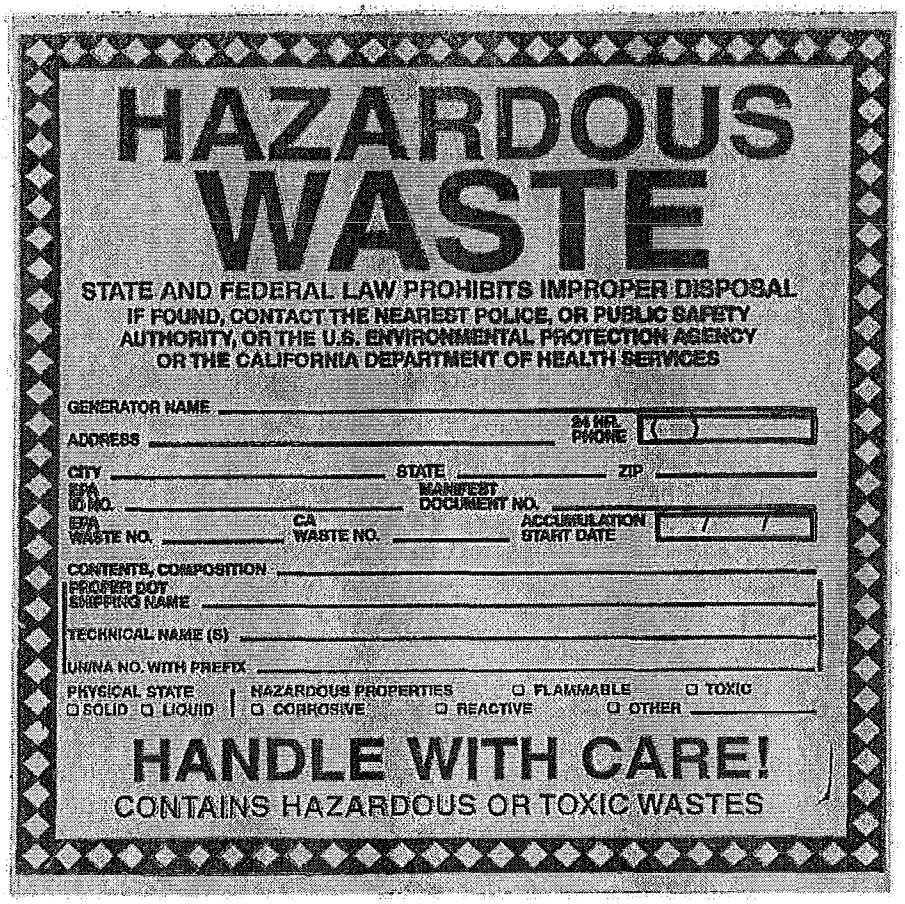
Block H: List any additional pertinent information.

Block I: Print or type the name of the facility representative submitting the report. Include the official signature and the date that the form was prepared.

MAIL THE COMPLETED REPORT TO:

State Emergency Response Commission (SERC)
Attn: Section 304 Reports
Hazardous Materials Unit
3650 Schriever Avenue
Mather, CA 95655

NOTE: Authority cited: Sections 25503, 25503.1 and 25507.1, Health and Safety Code. Reference: Sections 25503(b)(4), 25503.1, 25507.1, 25518 and 25520, Health and Safety Code.


HAZARDOUS
WASTE
STATE AND FEDERAL LAW PROHIBITS IMPROPER DISPOSAL
IF FOUND, CONTACT THE NEAREST POLICE, OR PUBLIC SAFETY
AUTHORITY, OR THE U.S. ENVIRONMENTAL PROTECTION AGENCY
OR THE CALIFORNIA DEPARTMENT OF HEALTH SERVICES
GENERATOR NAME
ADDRESS
24 HR. PHONE
CITY
STATE
ZIP
EPA ID NO.
MANIFEST DOCUMENT NO.
EPA WASTE NO.
CA WASTE NO.
ACCUMULATION START DATE
CONTENTS, COMPOSITION
PROPER DOT SHIPPING NAME
TECHNICAL NAME (S)
UN/NA NO. WITH PREFIX
PHYSICAL STATE
SOLID
LIQUID
HAZARDOUS PROPERTIES
CORROSIVE
REACTIVE
FLAMMABLE
TOXIC
OTHER
HANDLE WITH CARE!
CONTAINS HAZARDOUS OR TOXIC WASTES

APPENDIX H

MEMORANDUM: IMPLEMENTATION OF AMERICAN IRON AND STEEL PROVISIONS of 9.1. 113-76, CONSOLIDATED APPROPRIATIONS ACT, 2014

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

MAR 20 2014

OFFICE OF WATER

MEMORANDUM

SUBJECT: Implementation of American Iron and Steel provisions of P.L. 113-76, Consolidated Appropriations Act, 2014

FROM: for Andrew D. Sawyers, Director
Office of Wastewater Management (4201M)

Peter C. Grevatt, Director
Office of Ground Water and Drinking Water (4601M)

TO: Water Management Division Directors
Regions I - X

P.L. 113-76, Consolidated Appropriations Act, 2014 (Act), includes an "American Iron and Steel (AIS)" requirement in section 436 that requires Clean Water State Revolving Loan Fund (CWSRF) and Drinking Water State Revolving Loan Fund (DWSRF) assistance recipients to use iron and steel products that are produced in the United States for projects for the construction, alteration, maintenance, or repair of a public water system or treatment works if the project is funded through an assistance agreement executed beginning January 17, 2014 (enactment of the Act), through the end of Federal Fiscal Year 2014.

Section 436 also sets forth certain circumstances under which EPA may waive the AIS requirement. Furthermore, the Act specifically exempts projects where engineering plans and specifications were approved by a State agency prior to January 17, 2014.

The approach described below explains how EPA will implement the AIS requirement. The first section is in the form of questions and answers that address the types of projects that must comply with the AIS requirement, the types of products covered by the AIS requirement, and compliance. The second section is a step-by-step process for requesting waivers and the circumstances under which waivers may be granted.

Implementation

The Act states:

Sec. 436. (a)(1) None of the funds made available by a State water pollution control revolving fund as authorized by title VI of the Federal Water Pollution Control Act (33 U.S.C. 1381 et seq.) or made available by a drinking water treatment revolving loan fund as authorized by section 1452 of the Safe Drinking Water Act (42 U.S.C. 300j–12) shall be used for a project for the construction, alteration, maintenance, or repair of a public water system or treatment works unless all of the iron and steel products used in the project are produced in the United States.

(2) In this section, the term ''iron and steel products'' means the following products made primarily of iron or steel: lined or unlined pipes and fittings, manhole covers and other municipal castings, hydrants, tanks, flanges, pipe clamps and restraints, valves, structural steel, reinforced precast concrete, and construction materials.

(b) Subsection (a) shall not apply in any case or category of cases in which the Administrator of the Environmental Protection Agency (in this section referred to as the ''Administrator'') finds that—

(1) applying subsection (a) would be inconsistent with the public interest;

(2) iron and steel products are not produced in the United States in sufficient and reasonably available quantities and of a satisfactory quality; or

(3) inclusion of iron and steel products produced in the United States will increase the cost of the overall project by more than 25 percent.

(c) If the Administrator receives a request for a waiver under this section, the Administrator shall make available to the public on an informal basis a copy of the request and information available to the Administrator concerning the request, and shall allow for informal public input on the request for at least 15 days prior to making a finding based on the request. The Administrator shall make the request and accompanying information available by electronic means, including on the official public Internet Web site of the Environmental Protection Agency.

(d) This section shall be applied in a manner consistent with United States obligations under international agreements.

(e) The Administrator may retain up to 0.25 percent of the funds appropriated in this Act for the Clean and Drinking Water State Revolving Funds for carrying out

the provisions described in subsection (a)(1) for management and oversight of the requirements of this section.

(f) This section does not apply with respect to a project if a State agency approves the engineering plans and specifications for the project, in that agency's capacity to approve such plans and specifications prior to a project requesting bids, prior to the date of the enactment of this Act.

The following questions and answers provide guidance for implementing and complying with the AIS requirements:

Project Coverage

1) What classes of projects are covered by the AIS requirement?

All treatment works projects funded by a CWSRF assistance agreement, and all public water system projects funded by a DWSRF assistance agreement, from the date of enactment through the end of Federal Fiscal Year 2014, are covered. The AIS requirements apply to the entirety of the project, no matter when construction begins or ends. Additionally, the AIS requirements apply to all parts of the project, no matter the source of funding.

2) Does the AIS requirement apply to nonpoint source projects or national estuary projects?

No. Congress did not include an AIS requirement for nonpoint source and national estuary projects unless the project can also be classified as a 'treatment works' as defined by section 212 of the Clean Water Act.

3) Are any projects for the construction, alteration, maintenance, or repair of a public water system or treatment works excluded from the AIS requirement?

Any project, whether a treatment works project or a public water system project, for which engineering plans and specifications were approved by the responsible state agency prior to January 17, 2014, is excluded from the AIS requirements.

4) What if the project does not have approved engineering plans and specifications but has signed an assistance agreement with a CWSRF or DWSRF program prior to January 17, 2014?

The AIS requirements do not apply to any project for which an assistance agreement was signed prior to January 17, 2014.

5) What if the project does not have approved engineering plans and specifications, but bids were advertised prior to January 17, 2014 and an assistance agreement was signed after January 17, 2014?

If the project does not require approved engineering plans and specifications, the bid advertisement date will count in lieu of the approval date for purposes of the exemption in section 436(f).

6) What if the assistance agreement that was signed prior to January 17, 2014, only funded a part of the overall project, where the remainder of the project will be funded later with another SRF loan?

If the original assistance agreement funded any construction of the project, the date of the original assistance agreement counts for purposes of the exemption. If the original assistance agreement was only for planning and design, the date of that assistance agreement will count for purposes of the exemption only if there is a written commitment or expectation on the part of the assistance recipient to fund the remainder of the project with SRF funds.

7) What if the assistance agreement that was signed prior to January 17, 2014, funded the first phase of a multi-phase project, where the remaining phases will be funded by SRF assistance in the future?

In such a case, the phases of the project will be considered a single project if all construction necessary to complete the building or work, regardless of the number of contracts or assistance agreements involved, are closely related in purpose, time and place. However, there are many situations in which major construction activities are clearly undertaken in phases that are distinct in purpose, time, or place. In the case of distinct phases, projects with engineering plans and specifications approval or assistance agreements signed prior to January 17, 2014 would be excluded from AIS requirements while those approved/signed on January 17, 2014, or later would be covered by the AIS requirements.

8) What if a project has split funding from a non-SRF source?

Many States intend to fund projects with "split" funding, from the SRF program and from State or other programs. Based on the Act language in section 436, which requires that American iron and steel products be used in any project for the construction, alteration, maintenance, or repair of a public water system or treatment works receiving SRF funding between and including January 17, 2014 and September 30, 2014, any project that is funded in whole or in part with such funds must comply with the AIS requirement. A "project" consists of all construction necessary to complete the building or work regardless of the number of contracts or assistance agreements involved so long as all contracts and assistance agreements awarded are closely related in purpose, time and place. This precludes the intentional splitting of SRF projects into separate and smaller contracts or assistance agreements to avoid AIS coverage on some portion of a larger

project, particularly where the activities are integrally and proximately related to the whole. However, there are many situations in which major construction activities are clearly undertaken in separate phases that are distinct in purpose, time, or place, in which case, separate contracts or assistance agreement for SRF and State or other funding would carry separate requirements.

9) What about refinancing?

If a project began construction, financed from a non-SRF source, prior to January 17, 2014, but is refinanced through an SRF assistance agreement executed on or after January 17, 2014 and prior to October 1, 2014, AIS requirements will apply to all construction that occurs on or after January 17, 2014, through completion of construction, unless, as is likely, engineering plans and specifications were approved by a responsible state agency prior to January 17, 2014. There is no retroactive application of the AIS requirements where a refinancing occurs for a project that has completed construction prior to January 17, 2014.

10) Do the AIS requirements apply to any other EPA programs, besides the SRF program, such as the Tribal Set-aside grants or grants to the Territories and DC?

No, the AIS requirement only applies to funds made available by a State water pollution control revolving fund as authorized by title VI of the Federal Water Pollution Control Act (33 U.S.C. 1381 et seq.) or made available by a drinking water treatment revolving loan fund as authorized by section 1452 of the Safe Drinking Water Act (42 U.S.C. 300j–12)

Covered Iron and Steel Products

11) What is an iron or steel product?

For purposes of the CWSRF and DWSRF projects that must comply with the AIS requirement, an iron or steel product is one of the following made primarily of iron or steel that is permanently incorporated into the public water system or treatment works:

Lined or unlined pipes or fittings;
Manhole Covers;
Municipal Castings (defined in more detail below);
Hydrants;
Tanks;
Flanges;
Pipe clamps and restraints;
Valves;
Structural steel (defined in more detail below);
Reinforced precast concrete; and
Construction materials (defined in more detail below).

12) What does the term 'primarily iron or steel' mean?

'Primarily iron or steel' places constraints on the list of products above. For one of the listed products to be considered subject to the AIS requirements, it must be made of greater than 50% iron or steel, measured by cost. The cost should be based on the material costs.

13) Can you provide an example of how to perform a cost determination?

For example, the iron portion of a fire hydrant would likely be the bonnet, body and shoe, and the cost then would include the pouring and casting to create those components. The other material costs would include non-iron and steel internal workings of the fire hydrant (i.e., stem, coupling, valve, seals, etc). However, the assembly of the internal workings into the hydrant body would not be included in this cost calculation. If one of the listed products is not made primarily of iron or steel, United States (US) provenance is not required. An exception to this definition is reinforced precast concrete, which is addressed in a later question.

14) If a product is composed of more than 50% iron or steel, but is not listed in the above list of items, must the item be produced in the US? Alternatively, must the iron or steel in such a product be produced in the US?

The answer to both question is no. Only items on the above list must be produced in the US. Additionally, the iron or steel in a non-listed item can be sourced from outside the US.

15) What is the definition of steel?

Steel means an alloy that includes at least 50 percent iron, between .02 and 2 percent carbon, and may include other elements. Metallic elements such as chromium, nickel, molybdenum, manganese, and silicon may be added during the melting of steel for the purpose of enhancing properties such as corrosion resistance, hardness, or strength. The definition of steel covers carbon steel, alloy steel, stainless steel, tool steel and other specialty steels.

16) What does 'produced in the United States' mean?

Production in the United States of the iron or steel products used in the project requires that all manufacturing processes, including application of coatings, must take place in the United States, with the exception of metallurgical processes involving refinement of steel additives. All manufacturing processes includes processes such as melting, refining, forming, rolling, drawing, finishing, fabricating and coating. Further, if a domestic iron and steel product is taken out of the US for any part of the manufacturing process, it becomes foreign source material. However, raw materials such as iron ore, limestone and iron and steel scrap are not covered by the AIS requirement, and the

material(s), if any, being applied as a coating are similarly not covered. Non-iron or steel components of an iron and steel product may come from non-US sources. For example, for products such as valves and hydrants, the individual non-iron and steel components do not have to be of domestic origin.

17) Are the raw materials used in the production of iron or steel required to come from US sources?

No. Raw materials, such as iron ore, limestone, scrap iron, and scrap steel, can come from non-US sources.

18) If an above listed item is primarily made of iron or steel, but is only at the construction site temporarily, must such an item be produced in the US?

No. Only the above listed products made primarily of iron or steel, permanently incorporated into the project must be produced in the US. For example trench boxes, scaffolding or equipment, which are removed from the project site upon completion of the project, are not required to be made of U.S. Iron or Steel.

19) What is the definition of 'municipal castings'?

Municipal castings are cast iron or steel infrastructure products that are melted and cast. They typically provide access, protection, or housing for components incorporated into utility owned drinking water, storm water, wastewater, and surface infrastructure. They are typically made of grey or ductile iron, or steel. Examples of municipal castings are:

Access Hatches;
Ballast Screen;
Benches (Iron or Steel);
Bollards;
Cast Bases;
Cast Iron Hinged Hatches, Square and Rectangular;
Cast Iron Riser Rings;
Catch Basin Inlet;
Cleanout/Monument Boxes;
Construction Covers and Frames;
Curb and Corner Guards;
Curb Openings;
Detectable Warning Plates;
Downspout Shoes (Boot, Inlet);
Drainage Grates, Frames and Curb Inlets;
Inlets;
Junction Boxes;
Lampposts;
Manhole Covers, Rings and Frames, Risers;

Meter Boxes;
Service Boxes;
Steel Hinged Hatches, Square and Rectangular;
Steel Riser Rings;
Trash receptacles;
Tree Grates;
Tree Guards;
Trench Grates; and
Valve Boxes, Covers and Risers.

20) What is 'structural steel'?

Structural steel is rolled flanged shapes, having at least one dimension of their cross-section three inches or greater, which are used in the construction of bridges, buildings, ships, railroad rolling stock, and for numerous other constructional purposes. Such shapes are designated as wide-flange shapes, standard I-beams, channels, angles, tees and zees. Other shapes include H-piles, sheet piling, tie plates, cross ties, and those for other special purposes.

21) What is a 'construction material' for purposes of the AIS requirement?

Construction materials are those articles, materials, or supplies made primarily of iron and steel, that are permanently incorporated into the project, not including mechanical and/or electrical components, equipment and systems. Some of these products may overlap with what is also considered "structural steel". This includes, but is not limited to, the following products: wire rod, bar, angles, concrete reinforcing bar, wire, wire cloth, wire rope and cables, tubing, framing, joists, trusses, fasteners (i.e., nuts and bolts), welding rods, decking, grating, railings, stairs, access ramps, fire escapes, ladders, wall panels, dome structures, roofing, ductwork, surface drains, cable hanging systems, manhole steps, fencing and fence tubing, guardrails, doors, and stationary screens.

22) What is not considered a 'construction material' for purposes of the AIS requirement?

Mechanical and electrical components, equipment and systems are not considered construction materials. Mechanical equipment is typically that which has motorized parts and/or is powered by a motor. Electrical equipment is typically any machine powered by electricity and includes components that are part of the electrical distribution system.

The following examples (including their appurtenances necessary for their intended use and operation) are NOT considered construction materials: pumps, motors, gear reducers, drives (including variable frequency drives (VFDs)), electric/pneumatic/manual accessories used to operate valves (such as electric valve actuators), mixers, gates, motorized screens (such as traveling screens), blowers/aeration equipment, compressors, meters, sensors, controls and switches, supervisory control and

data acquisition (SCADA), membrane bioreactor systems, membrane filtration systems, filters, clarifiers and clarifier mechanisms, rakes, grinders, disinfection systems, presses (including belt presses), conveyors, cranes, HVAC (excluding ductwork), water heaters, heat exchangers, generators, cabinetry and housings (such as electrical boxes/enclosures), lighting fixtures, electrical conduit, emergency life systems, metal office furniture, shelving, laboratory equipment, analytical instrumentation, and dewatering equipment.

23) If the iron or steel is produced in the US, may other steps in the manufacturing process take place outside of the US, such as assembly?

No. Production in the US of the iron or steel used in a listed product requires that all manufacturing processes must take place in the United States, except metallurgical processes involving refinement of steel additives.

24) What processes must occur in the US to be compliant with the AIS requirement for reinforced precast concrete?

While reinforced precast concrete may not be at least 50% iron or steel, in this particular case, the reinforcing bar and wire must be produced in the US and meet the same standards as for any other iron or steel product. Additionally, the casting of the concrete product must take place in the US. The cement and other raw materials used in concrete production are not required to be of domestic origin.

If the reinforced concrete is cast at the construction site, the reinforcing bar and wire are considered to be a construction material and must be produced in the US.

Compliance

25) How should an assistance recipient document compliance with the AIS requirement?

In order to ensure compliance with the AIS requirement, specific AIS contract language must be included in each contract, starting with the assistance agreement, all the way down to the purchase agreements. Sample language for assistance agreements and contracts can be found in Appendix 3 and 4.

EPA recommends the use of a step certification process, similar to one used by the Federal Highway Administration. The step certification process is a method to ensure that producers adhere to the AIS requirement and assistance recipients can verify that products comply with the AIS requirement. The process also establishes accountability and better enables States to take enforcement actions against violators.

Step certification creates a paper trail which documents the location of the manufacturing process involved with the production of steel and iron materials. A step certification is a process under which each handler (supplier, fabricator, manufacturer,

processor, etc) of the iron and steel products certifies that their step in the process was domestically performed. Each time a step in the manufacturing process takes place, the manufacturer delivers its work along with a certification of its origin. A certification can be quite simple. Typically, it includes the name of the manufacturer, the location of the manufacturing facility where the product or process took place (not its headquarters), a description of the product or item being delivered, and a signature by a manufacturer's responsible party. Attached, as Appendix 5, are sample certifications. These certifications should be collected and maintained by assistance recipients.

Alternatively, the final manufacturer that delivers the iron or steel product to the worksite, vendor, or contractor, may provide a certification asserting that all manufacturing processes occurred in the US. While this type of certification may be acceptable, it may not provide the same degree of assurance. Additional documentation may be needed if the certification is lacking important information. Step certification is the best practice.

26) How should a State ensure assistance recipients are complying with the AIS requirement?

In order to ensure compliance with the AIS requirement, States SRF programs must include specific AIS contract language in the assistance agreement. Sample language for assistance agreements can be found in Appendix 3.

States should also, as a best practice, conduct site visits of projects during construction and review documentation demonstrating proof of compliance which the assistance recipient has gathered.

27) What happens if a State or EPA finds a non-compliant iron and/or steel product permanently incorporated in the project?

If a potentially non-compliant product is identified, the State should notify the assistance recipient of the apparent unauthorized use of the non-domestic component, including a proposed corrective action, and should be given the opportunity to reply. If unauthorized use is confirmed, the State can take one or more of the following actions: request a waiver where appropriate; require the removal of the non-domestic item; or withhold payment for all or part of the project. Only EPA can issue waivers to authorize the use of a non-domestic item. EPA may use remedies available to it under the Clean Water Act, the Safe Drinking Water Act, and 40 CFR part 31 grant regulations, in the event of a violation of a grant term and condition.

It is recommended that the State work collaboratively with EPA to determine the appropriate corrective action, especially in cases where the State is the one who identifies the item in noncompliance or there is a disagreement with the assistance recipient.

If fraud, waste, abuse, or any violation of the law is suspected, the Office of Inspector General (OIG) should be contacted immediately. The OIG can be reached at 1-

888-546-8740 or OIG_Hotline@epa.gov. More information can be found at this website: http://www.epa.gov/oig/hotline.htm.

28) How do international trade agreements affect the implementation of the AIS requirements?

The AIS provision applies in a manner consistent with United States obligations under international agreements. Typically, these obligations only apply to direct procurement by the entities that are signatories to such agreements. In general, SRF assistance recipients are not signatories to such agreements, so these agreements have no impact on this AIS provision. In the few instances where such an agreement applies to a municipality, that municipality is under the obligation to determine its applicability and requirements and document the actions taken to comply for the State.

Waiver Process

The statute permits EPA to issue waivers for a case or category of cases where EPA finds (1) that applying these requirements would be inconsistent with the public interest; (2) iron and steel products are not produced in the US in sufficient and reasonably available quantities and of a satisfactory quality; or (3) inclusion of iron and steel products produced in the US will increase the cost of the overall project by more than 25 percent.

In order to implement the AIS requirements, EPA has developed an approach to allow for effective and efficient implementation of the waiver process to allow projects to proceed in a timely manner. The framework described below will allow States, on behalf of the assistance recipients, to apply for waivers of the AIS requirement directly to EPA Headquarters. Only waiver requests received from states will be considered. Pursuant to the Act, EPA has the responsibility to make findings as to the issuance of waivers to the AIS requirements.

Definitions

The following terms are critical to the interpretation and implementation of the AIS requirements and apply to the process described in this memorandum:

Reasonably Available Quantity: The quantity of iron or steel products is available or will be available at the time needed and place needed, and in the proper form or specification as specified in the project plans and design.

Satisfactory Quality: The quality of iron or steel products, as specified in the project plans and designs.

Assistance Recipient: A borrower or grantee that receives funding from a State CWSRF or DWSRF program.

Step-By-Step Waiver Process

Application by Assistance Recipient

Each local entity that receives SRF water infrastructure financial assistance is required by section 436 of the Act to use American made iron and steel products in the construction of its project. However, the recipient may request a waiver. Until a waiver is granted by EPA, the AIS requirement stands, except as noted above with respect to municipalities covered by international agreements.

The waiver process begins with the SRF assistance recipient. In order to fulfill the AIS requirement, the assistance recipient must in good faith design the project (where applicable) and solicit bids for construction with American made iron and steel products. It is essential that the assistance recipient include the AIS terms in any request for proposals or solicitations for bids, and in all contracts (see Appendix 3 for sample construction contract language). The assistance recipient may receive a waiver at any point before, during, or after the bid process, if one or more of three conditions is met:

1. Applying the American Iron and Steel requirements of the Act would be inconsistent with the public interest;
2. Iron and steel products are not produced in the United States in sufficient and reasonably available quantities and of a satisfactory quality; or
3. Inclusion of iron and steel products produced in the United States will increase the cost of the overall project by more than 25 percent.

Proper and sufficient documentation must be provided by the assistance recipient. A checklist detailing the types of information required for a waiver to be processed is attached as Appendix 1.

Additionally, it is strongly encouraged that assistance recipients hold pre-bid conferences with potential bidders. A pre-bid conference can help to identify iron and steel products needed to complete the project as described in the plans and specifications that may not be available from domestic sources. It may also identify the need to seek a waiver prior to bid, and can help inform the recipient on compliance options.

In order to apply for a project waiver, the assistance recipient should email the request in the form of a Word document (.doc) to the State SRF program. It is strongly recommended that the State designate a single person for all AIS communications. The State SRF designee will review the application for the waiver and determine whether the necessary information has been included. Once the waiver application is complete, the State designee will forward the application to either of two email addresses. For CWSRF waiver requests, please send the application to: cwsrfwaiver@epa.gov. For DWSRF waiver requests, please send the application to: dwsrfwaiver@epa.gov.

Evaluation by EPA

After receiving an application for waiver of the AIS requirements, EPA Headquarters will publish the request on its website for 15 days and receive informal comment. EPA Headquarters will then use the checklist in Appendix 2 to determine whether the application properly and adequately documents and justifies the statutory basis cited for the waiver – that it is quantitatively and qualitatively sufficient – and to determine whether or not to grant the waiver.

In the event that EPA finds that adequate documentation and justification has been submitted, the Administrator may grant a waiver to the assistance recipient. EPA will notify the State designee that a waiver request has been approved or denied as soon as such a decision has been made. Granting such a waiver is a three-step process:

1. Posting – After receiving an application for a waiver, EPA is required to publish the application and all material submitted with the application on EPA's website for 15 days. During that period, the public will have the opportunity to review the request and provide informal comment to EPA. The website can be found at: http://water.epa.gov/grants_funding/aisrequirement.cfm

2. Evaluation – After receiving an application for waiver of the AIS requirements, EPA Headquarters will use the checklist in Appendix 2 to determine whether the application properly and adequately documents and justifies the statutory basis cited for the waiver – that it is quantitatively and qualitatively sufficient – and to determine whether or not to grant the waiver.

3. Signature of waiver approval by the Administrator or another agency official with delegated authority – As soon as the waiver is signed and dated, EPA will notify the State SRF program, and post the signed waiver on our website. The assistance recipient should keep a copy of the signed waiver in its project files.

Public Interest Waivers

EPA has the authority to issue public interest waivers. Evaluation of a public interest waiver request may be more complicated than that of other waiver requests so they may take more time than other waiver requests for a decision to be made. An example of a public interest waiver that might be issued could be for a community that has standardized on a particular type or manufacturer of a valve because of its performance to meet their specifications. Switching to an alternative valve may require staff to be trained on the new equipment and additional spare parts would need to be purchased and stocked, existing valves may need to be unnecessarily replaced, and portions of the system may need to be redesigned. Therefore, requiring the community to install an alternative valve would be inconsistent with public interest.

EPA also has the authority to issue a public interest waiver that covers categories of products that might apply to all projects.

EPA reserves the right to issue national waivers that may apply to particular classes of assistance recipients, particular classes of projects, or particular categories of iron or steel products. EPA may develop national or (US geographic) regional categorical waivers through the identification of similar circumstances in the detailed justifications presented to EPA in a waiver request or requests. EPA may issue a national waiver based on policy decisions regarding the public's interest or a determination that a particular item is not produced domestically in reasonably available quantities or of a sufficient quality. In such cases, EPA may determine it is necessary to issue a national waiver.

If you have any questions concerning the contents of this memorandum, you may contact us, or have your staff contact Jordan Dorfman, Attorney-Advisor, State Revolving Fund Branch, Municipal Support Division, at dorfman.jordan@epa.gov or (202) 564-0614 or Kiri Anderer, Environmental Engineer, Infrastructure Branch, Drinking Water Protection Division, at anderer.kirsten@epa.gov or (202) 564-3134.

Attachments

Appendix 1: Information Checklist for Waiver Request

The purpose of this checklist is to help ensure that all appropriate and necessary information is submitted to EPA. EPA recommends that States review this checklist carefully and provide all appropriate information to EPA. This checklist is for informational purposes only and does not need to be included as part of a waiver application.

Items	✓	Notes
General • Waiver request includes the following information: — Description of the foreign and domestic construction materials — Unit of measure — Quantity — Price — Time of delivery or availability — Location of the construction project — Name and address of the proposed supplier — A detailed justification for the use of foreign construction materials • Waiver request was submitted according to the instructions in the memorandum • Assistance recipient made a good faith effort to solicit bids for domestic iron and steel products, as demonstrated by language in requests for proposals, contracts, and communications with the prime contractor		
Cost Waiver Requests • Waiver request includes the following information: — Comparison of overall cost of project with domestic iron and steel products to overall cost of project with foreign iron and steel products — Relevant excerpts from the bid documents used by the contractors to complete the comparison — Supporting documentation indicating that the contractor made a reasonable survey of the market, such as a description of the process for identifying suppliers and a list of contacted suppliers		
Availability Waiver Requests • Waiver request includes the following supporting documentation necessary to demonstrate the availability, quantity, and/or quality of the materials for which the waiver is requested: — Supplier information or pricing information from a reasonable number of domestic suppliers indicating availability/delivery date for construction materials — Documentation of the assistance recipient's efforts to find available domestic sources, such as a description of the process for identifying suppliers and a list of contacted suppliers. — Project schedule — Relevant excerpts from project plans, specifications, and permits indicating the required quantity and quality of construction materials • Waiver request includes a statement from the prime contractor and/or supplier confirming the non-availability of the domestic construction materials for which the waiver is sought • Has the State received other waiver requests for the materials described in this waiver request, for comparable projects?		

Appendix 2: HQ Review Checklist for Waiver Request

Instructions: To be completed by EPA. Review all waiver requests using the questions in the checklist, and mark the appropriate box as Yes, No or N/A. Marks that fall inside the shaded boxes may be grounds for denying the waiver. If none of your review markings fall into a shaded box, the waiver is eligible for approval if it indicates that one or more of the following conditions applies to the domestic product for which the waiver is sought:

1. The iron and/or steel products are not produced in the United States in sufficient and reasonably available quantities and of a satisfactory quality.
2. The inclusion of iron and/or steel products produced in the United States will increase the cost of the overall project by more than 25 percent.

Review Items	Yes	No	N/A	Comments
Cost Waiver Requests • Does the waiver request include the following information? — Comparison of overall cost of project with domestic iron and steel products to overall cost of project with foreign iron and steel products — Relevant excerpts from the bid documents used by the contractors to complete the comparison — A sufficient number of bid documents or pricing information from domestic sources to constitute a reasonable survey of the market • Does the Total Domestic Project exceed the Total Foreign Project Cost by more than 25%?				
Availability Waiver Requests • Does the waiver request include supporting documentation sufficient to show the availability, quantity, and/or quality of the iron and/or steel product for which the waiver is requested? — Supplier information or other documentation indicating availability/delivery date for materials — Project schedule — Relevant excerpts from project plans, specifications, and permits indicating the required quantity and quality of materials • Does supporting documentation provide sufficient evidence that the contractors made a reasonable effort to locate domestic suppliers of materials, such as a description of the process for identifying suppliers and a list of contacted suppliers? • Based on the materials delivery/availability date indicated in the supporting documentation, will the materials be unavailable when they are needed according to the project schedule? (By item, list schedule date and domestic delivery quote date or other relevant information) • Is EPA aware of any other evidence indicating the non-availability of the materials for which the waiver is requested? Examples include: — Multiple waiver requests for the materials described in this waiver request, for comparable projects in the same State — Multiple waiver requests for the materials described in this waiver request, for comparable projects in other States — Correspondence with construction trade associations indicating the non-availability of the materials • Are the available domestic materials indicated in the bid documents of inadequate quality compared those required by the project plans, specifications, and/or permits?				

Appendix 3: Example Loan Agreement Language

ALL ASSISTANCE AGREEMENT MUST HAVE A CLAUSE REQUIRING COMPLIANCE WITH THE AIS REQUIREMENT. THIS IS AN EXAMPLE OF WHAT COULD BE INCLUDED IN SRF ASSISTANCE AGREEMENTS. EPA MAKES NO CLAIMS REGARDING THE LEGALITY OF THIS CLAUSE WITH RESPECT TO STATE LAW:

Comply with all federal requirements applicable to the Loan (including those imposed by the 2014 Appropriations Act and related SRF Policy Guidelines) which the Participant understands includes, among other, requirements that all of the iron and steel products used in the Project are to be produced in the United States ("American Iron and Steel Requirement") unless (i) the Participant has requested and obtained a waiver from the Agency pertaining to the Project or (ii) the Finance Authority has otherwise advised the Participant in writing that the American Iron and Steel Requirement is not applicable to the Project.

Comply with all record keeping and reporting requirements under the Clean Water Act/Safe Drinking Water Act, including any reports required by a Federal agency or the Finance Authority such as performance indicators of program deliverables, information on costs and project progress. The Participant understands that (i) each contract and subcontract related to the Project is subject to audit by appropriate federal and state entities and (ii) failure to comply with the Clean Water Act/Safe Drinking Water Act and this Agreement may be a default hereunder that results in a repayment of the Loan in advance of the maturity of the Bonds and/or other remedial actions.

Appendix 4: Sample Construction Contract Language

ALL CONTRACTS MUST HAVE A CLAUSE REQUIRING COMPLIANCE WITH THE AIS REQUIREMENT. THIS IS AN EXAMPLE OF WHAT COULD BE INCLUDED IN ALL CONTRACTS IN PROJECTS THAT USE SRF FUNDS. EPA MAKES NO CLAIMS REGARDING THE LEGALITY OF THIS CLAUSE WITH RESPECT TO STATE OR LOCAL LAW:

The Contractor acknowledges to and for the benefit of the City of _____ ("Purchaser") and the _____ (the "State") that it understands the goods and services under this Agreement are being funded with monies made available by the Clean Water State Revolving Fund and/or Drinking Water State Revolving Fund that have statutory requirements commonly known as "American Iron and Steel;" that requires all of the iron and steel products used in the project to be produced in the United States ("American Iron and Steel Requirement") including iron and steel products provided by the Contactor pursuant to this Agreement. The Contractor hereby represents and warrants to and for the benefit of the Purchaser and the State that (a) the Contractor has reviewed and understands the American Iron and Steel Requirement, (b) all of the iron and steel products used in the project will be and/or have been produced in the United States in a manner that complies with the American Iron and Steel Requirement, unless a waiver of the requirement is approved, and (c) the Contractor will provide any further verified information, certification or assurance of compliance with this paragraph, or information necessary to support a waiver of the American Iron and Steel Requirement, as may be requested by the Purchaser or the State. Notwithstanding any other provision of this Agreement, any failure to comply with this paragraph by the Contractor shall permit the Purchaser or State to recover as damages against the Contractor any loss, expense, or cost (including without limitation attorney's fees) incurred by the Purchaser or State resulting from any such failure (including without limitation any impairment or loss of funding, whether in whole or in part, from the State or any damages owed to the State by the Purchaser). While the Contractor has no direct contractual privity with the State, as a lender to the Purchaser for the funding of its project, the Purchaser and the Contractor agree that the State is a third-party beneficiary and neither this paragraph (nor any other provision of this Agreement necessary to give this paragraph force or effect) shall be amended or waived without the prior written consent of the State.

Appendix 5: Sample Certifications

The following information is provided as a sample letter of **step** certification for AIS compliance. Documentation must be provided on company letterhead.

Date

Company Name

Company Address

City, State Zip

Subject: American Iron and Steel Step Certification for Project (XXXXXXXXXX)

I, (company representative), certify that the (melting, bending, coating, galvanizing, cutting, etc.) process for (manufacturing or fabricating) the following products and/or materials shipped or provided for the subject project is in full compliance with the American Iron and Steel requirement as mandated in EPA's State Revolving Fund Programs.

Item, Products and/or Materials:

1. Xxxx
2. Xxxx
3. Xxxx

Such process took place at the following location:

_____

If any of the above compliance statements change while providing material to this project we will immediately notify the prime contractor and the engineer.

Signed by company representative

The following information is provided as a sample letter of certification for AIS compliance. Documentation must be provided on company letterhead.

Date

Company Name

Company Address

City, State Zip

Subject: American Iron and Steel Certification for Project (XXXXXXXXXX)

I, (company representative), certify that the following products and/or materials shipped/provided to the subject project are in full compliance with the American Iron and Steel requirement as mandated in EPA's State Revolving Fund Programs.

Item, Products and/or Materials:

1. Xxxx
2. Xxxx
3. Xxxx

Such process took place at the following location:

_____

If any of the above compliance statements change while providing material to this project we will immediately notify the prime contractor and the engineer.

Signed by company representative

APPENDIX I

SAMPLE CERTIFICATION LETTERS FOR AMERICAN IRON AND STEEL COMPLIANCE

SAMPLE CERTIFICATION LETTERS

The following information is provided as a sample letter of **step** certification for AIS compliance. Documentation must be provided on company letterhead.

Date

Company Name

Company Address

City, State Zip

Subject: American Iron and Steel Step Certification for Project (XXXXXXXXXX)

I, (company representative), certify that the (melting, bending, coating, galvanizing, cutting, etc.) process for (manufacturing or fabricating) the following products and/or materials shipped or provided for the subject project is in full compliance with the American Iron and Steel requirement as mandated in EPA's State Revolving Fund Programs.

Item, Products and/or Materials:

1. Xxxx
2. Xxxx
3. Xxxx

Such process took place at the following location:

_____

If any of the above compliance statements change while providing material to this project we will immediately notify the prime contractor and the engineer.

Signed by company representative

The following information is provided as a sample letter of certification for AIS compliance. Documentation must be provided on company letterhead.

Date

Company Name

Company Address

City, State Zip

Subject: American Iron and Steel Certification for Project (XXXXXXXXXX)

I, (company representative), certify that the following products and/or materials shipped/provided to the subject project are in full compliance with the American Iron and Steel requirement as mandated in EPA's State Revolving Fund Programs.

Item, Products and/or Materials:

1. Xxxx
2. Xxxx
3. Xxxx

Such process took place at the following location:

_____

If any of the above compliance statements change while providing material to this project we will immediately notify the prime contractor and the engineer.

Signed by company representative

APPENDIX J

SAMPLE ARCHAEOLOGY INVOICE

(FOR ARCHAEOLOGY ONLY)
Company Name
Address, telephone, fax

Date: Insert Date

To: Name of Resident Engineer
City of San Diego
Field Engineering Division
9485 Aero Drive
San Diego, CA 92123-1801

Project Name: Insert Project Name

SAP Number (WBS/IO/CC): Insert SAP Number

Drawing Number: Insert Drawing Number

Invoice period: Insert Date to Insert Date

Work Completed: Bid item Number – Description of Bid Item – Quantity – Unit Price– Amount

Detailed summary of work completed under this bid item: Insert detailed description of Work related to Archaeology Monitoring Bid item. See Note 1 below.

Summary of charges:

Description of Services	Name	Start Date	End Date	Total Hours	Hourly Rate	Amount
Field Archaeologist	Joe Smith	8/29/2011	9/2/2011	40	$84	$3,360
Laboratory Assistant	Jane Doe	8/29/2011	9/2/2011	2	$30	$60
Subtotal						$3,420

Work Completed: Bid item Number – Description of Bid Item – Quantity – Unit Price– Amount

Detailed summary of work completed under this bid item: Insert detailed description of Work related to Archaeology Curation/Discovery Bid item. See Note 2 below.

Summary of charges:

Description of Services	Where work occurred (onsite vs offsite/lab)	Name	Start Date	End Date	Total Hours	Hourly Rate	Amount
Field Archaeologist		Joe Smith	8/29/2011	9/2/2011	40	$84	$3,360
Laboratory Assistant		Jane Doe	8/29/2011	9/2/2011	2	$30	$60
Subtotal							$3,420

Total this invoice: $_____

Total invoiced to date: $_____

Note 1:

For monitoring related bid items or work please include summary of construction work that was monitored from Station to Station, Native American monitors present, MMC coordination, status and nature of monitoring and if any discoveries were made.

Note 2:

For curation/discovery related bid items or work completed as part of a discovery and curation process, the PI must provide a response to the following questions along with the invoice:

1. Preliminary results of testing including tentative recommendations regarding eligibility for listing in the California Register of Historical Resources (California Register).
    a. Please briefly describe your application (consideration) of all four California Register criteria.
    b. If the resource is eligible under Criterion D, please define the important information that may be present.
    c. Were specialized studies performed? How many personnel were required? How many Native American monitors were present?
    d. What is the age of the resource?
    e. Please define types of artifacts to be collected and curated, including quantity of boxes to be submitted to the San Diego Archaeological Center (SDAC). How many personnel were required? How many Native American monitors were present?
2. Preliminary results of data recovery and a definition of the size of the representative sample.
    a. Were specialized studies performed? Please define types of artifacts to be collected and curated, including quantity of boxes to be submitted to the SDAC. How many personnel were required? How many Native American monitors were present?
3. What resources were discovered during monitoring?
4. What is the landform context and what is the integrity of the resources?
5. What additional studies are necessary?
6. Based on application of the California Register criteria, what is the significance of the resources?
    a. If the resource is eligible for the California Register, can the resource be avoided by construction?
    b. If not, what treatment (mitigation) measures are proposed? Please define data to be recovered (if necessary) and what material will be submitted to the SDAC for curation. Are any specialized studies proposed?

(After the first invoice, not all the above information needs to be re-stated, just revise as applicable).

APPENDIX K

SAMPLE OF PUBLIC NOTICES

CONSTRUCTION NOTICE

PROJECT NAME

Trenching on your street is complete.

What you need to know:

- Pipe installation on your street is complete and construction crews are now installing new pipeline for this project at another location.
- You may see temporary trench plates or trench caps for some time –even after construction activities have concluded on your street.

Street resurfacing:

- Your Streets will be resurfaced once the entire pipeline project is complete.
- Concrete streets will not be resurfaced curb to curb; only the trench will be backfilled.
- Street resurfacing may be delayed due to the City's slurry seal moratorium.

Estimated resurfacing completion on your street:

(Insert Date-Month and Year)

For questions related to this work
Call: (619) 533-4207
Email: engineering@sandiego.gov
Visit: sandiego.gov/CIP

CITY OF SAN DIEGO
PUBLIC WORKS
DEPARTMENT

This information is available in alternative formats upon request.

APPENDIX L

GEOTECHNICAL STUDY

Geotechnical Study

City of San Diego Mohawk Pump Station
69th Street and Mohawk Street (NEC)
San Diego, California

Prepared for:

RBF Consulting
9755 Clairemont Mesa Blvd, Suite 100
San Diego, CA 92124

Attention: Mr. John Harris, P.E.

Project No.: V-0322-G

September 2, 2014

VO Engineering, Inc.
13230 Evening Creek Drive, Suite 207
San Diego, CA 92128

VO Engineering

RBF Consulting
9755 Clairemont Mesa Blvd, Suite 100
San Diego, CA 92124

September 2, 2014
Project No.: V-0322-G

Attention: Mr.John Harris, P.E.

Subject: Geotechnical Study

Project: City of San Diego Mohawk Pump Station
69th Street and Mohawk Street (NEC)
San Diego, California

Dear Mr. Harris:

This report presents the results of the geotechnical study for the proposed pump station project located the northeast corner of Mohawk Street and 69th Street in San Diego, California. The project also includes the design of new water mains. Recommendations and geotechnical parameters are presented herein to be used for the design and construction of foundations for the proposed pump station and accompanying water mains.

The attached report includes the subsurface soil/formational conditions observed during our study, a review of available relevant geotechnical documents, and geotechnical engineering analyses. It is our opinion that the site is suitable for the proposed improvements, provided recommendations and parameters contained in this report are incorporated during the design and construction of the proposed project. It is recommended that the forthcoming project plans and specifications, be reviewed by VO Engineering, Inc. (VOE) for consistency with our report prior to the bid process in order to avoid possible conflicts, misinterpretations, inadvertent omissions, etc.

VOE appreciates the opportunity to provide this geotechnical engineering service for this project and we look forward to continuing our role as your geotechnical engineering consultant.

Respectfully submitted,
VO Engineering, Inc.

REGISTERED PROFESSIONAL ENGINEER
NICHOLAS JAMES TRACY
No. C74777
Exp. 12/31/15
CIVIL - ENGINEER
STATE OF CALIFORNIA

Nick Tracy, P.E. 74777
Project Engineer

REGISTERED PROFESSIONAL ENGINEER
VAN OLIN
No. C-60078
No. GE-2578
Exp. 6/30/16
RCE, RGE
CIVIL-GEOTECHNICAL
STATE OF CALIFORNIA

Van Olin, G.E. 2578
Principal Geotechnical Engineer

9/2/14

NT/VO:bm

Distribution: (1) Addressee, via email

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FIGURES

APPENDICES

1. INTRODUCTION

This report provides the results of the geotechnical study conducted for the proposed Mohawk Pump Station located at the north east corner of the intersection of 69th Street and Mohawk Street. The project also includes approximately 7,600 linear feet of new water pipelines. The approximate location of the project in relation to surrounding streets and landmarks is presented on *Figure 1, Vicinity Map*. The purpose of this study was to evaluate the subsurface conditions within the project site and to provide geotechnical recommendations and parameters for the design and construction of the project. This report summarizes the data collected and presents our findings, conclusions, and geotechnical design recommendations.

2. SCOPE OF SERVICES

Our scope of services for this project included the following tasks:

- Review of readily available background data, including in-house geotechnical data, geotechnical reports, geotechnical literature, geologic maps, topographic maps, as-built plans, and literature relevant to the subject site.

- Performing a site reconnaissance to observe the general surficial conditions, check for accessibility, and to select the exploratory boring locations.

- Preparing traffic control plans and obtaining an encroachment permit to perform exploratory borings from the City of San Diego.

- Performing a field exploration program including ten exploratory borings to a maximum depth of approximately 19 feet (see *Appendix A, Exploratory Boring Logs*).

- Performing laboratory testing on selected representative bulk and relatively undisturbed soil samples obtained during the field exploration program to evaluate the geotechnical engineering properties of these materials (see *Appendix B, Laboratory Test Results*).

- Performing an assessment of general geoseismic conditions and geotechnical hazards affecting the area and their possible impact on the subject project.

- Engineering evaluation of the data collected to develop geotechnical design parameters and recommendations for the proposed pump station and pipelines.

- Preparation of this report including reference maps and graphics, presenting our findings, conclusions and geotechnical design recommendations specifically addressing the following items:
    - Evaluation of general subsurface conditions and description of types, distribution, and engineering characteristics of subsurface materials.
    - Evaluation of project feasibility and suitability of on-site soils for earthwork and foundation support.
    - Recommendations including site earthwork and geotechnical parameters to be used for foundation design.

3. SITE & PROJECT DESCRIPTION

The project consists of constructing a new 18 million gallon per day (MGD) pump station at the north east corner of 69th and Mohawk Street in San Diego, California. The site is currently occupied by a pump station that is currently out of service and to be demolished prior to construction of the new facility. The proposed site is rectangular in shape and mostly flat with an average elevation of approximately 474 feet above mean sea level (MSL).

In addition to the pump station, approximately 7,600 linear feet of new water pipelines ranging from 8 to 30 inches in diameter will be constructed at approximately 10 to 12 feet below grade. The layout of the proposed pipelines is shown on *Figure 1, Vicinity Map.*

4. FIELD EXPLORATION PROGRAM

Prior to the start of the field exploration program, a field reconnaissance was conducted to observe site conditions and determine the locations of our planned exploration. In accordance with local regulations, Underground Service Alert was notified of our excavations 48 hours prior to drilling. An encroachment permit was also obtained from the City of San Diego to comply with their requirements.

On August 15 and 18, 2014, ten exploratory borings were drilled with a Marl M5 drill rig to a maximum depth of about 19 feet below existing grades within the footprint of the proposed pump station and water line alignment. The 8-inch hollow stem auger borings were logged by a geologist from our firm. Bulk and relatively undisturbed drive samples of the subsurface soils were obtained at various depths in the exploratory borings. The samples were examined and classified according to the Unified Soil Classification System (USCS). The borings were then backfilled with the cuttings and capped with asphalt to match existing conditions.

The approximate locations of the exploratory borings are shown on *Figure 2, Plot Plan.* Logs of the subsurface conditions encountered were recorded by a geologist, and the results are presented in *Appendix A, Exploratory Boring Logs.*

5. LABORATORY TESTING

Laboratory testing was performed on selected representative bulk and relatively undisturbed soil samples obtained from the exploratory borings, to aid in the soil classification and to evaluate engineering properties of the foundation soil. The following tests were performed:

- In-situ moisture content and dry density (ASTM D-2216 and ASTM D-2937);
- Particle size analyses and No. 200-wash (ASTM D-422 and ASTM D-1140);
- Direct Shear (ASTM D-3080);
- Expansion Index (ASTM D-4829);
- R-Value (ASTM D-2844);
- Corrosivity series including sulfate content, chloride content, pH-value, and resistivity (CTM 417, 422, and 643).

Testing was performed in general accordance with applicable ASTM standards and California Test Methods. A summary of the laboratory testing program and the laboratory test results are presented in *Appendix B, Laboratory Test Results.*

6. SUBSURFACE CONDITIONS

A brief description of the subsurface conditions encountered on this site is presented in the following sections. A more detailed description of these materials is provided in *Appendix A, Exploratory Boring Logs*. Based on our site reconnaissance, subsurface excavations, and review of geologic maps, the project site is underlain to depth by Very Old Paralic Deposits. Fill soils with depths ranging from 1 to 2 feet were observed to overlie the Very Old Paralic Deposits. A map of the project geology is shown in *Figure 3, Regional Geology Map.*

6.1 Fill

Fill soils were observed within each boring to a depth of about 1 to 2 feet below the existing grade within the pump station and along the pipeline alignment. The fill materials consisted of brown, moist clayey sands with in a medium dense condition. Within the roadways along the alignment, the surface was capped with asphaltic concrete ranging from 5 to 7 inches thick.

6.2 Very Old Paralic Deposits ($Qvop_7$)

Very Old Paralic Deposits were encountered in each exploratory boring at a depth of about 2feet below existing grades. As encountered, these materials consisted of clayey sands, sandy clays, and silty sands. An abundance of gravel and occasional cobble was observed within the formational material. Refusal within the Old Paralic Deposits on gravel layers was encountered within pump station area at a depth of 16 feet and 19 feet. Refusal was also encountered within the boring at the western portion of the pipeline alignment (B-1) at a depth of 7 feet. Very dense formational materials with an abundance of gravel should be anticipated for excavations below 7 feet on the western portion of the project and below 16 feet on the eastern portion of the project.

6.3 Groundwater

Indications of a static groundwater table were not encountered during our subsurface investigation to a depth of 19 feet. However it should be noted that very moist soils were encountered at about 10 feet within Boring B-6 and B-9. These very moist soils may indicate a localized seepage zone. Based on review of previous subsurface information obtained from the State Water Resources Control Board, groundwater is anticipated at minimum depth of 34 feet below the existing grades at the western portion of the alignment. If construction activities extend to depths near or beyond 34 feet, construction dewatering should be anticipated. At the eastern portion of the alignment in the vicinity of the pump station, groundwater is anticipated at a minimum depth of approximately 60 feet below existing grade. It should also be noted that near-surface groundwater conditions can develop in areas where no such groundwater conditions previously existed, especially in areas where a substantial increase in surface water infiltration results from landscape irrigation or unusually heavy precipitation.

7. GEOSEISMIC AND GEOTECHNICAL HAZARDS

The findings of our geoseismic and geotechnical hazards evaluation for the project site are summarized in the sections below.

7.1 Faults

The surface traces of active faults are not known to pass directly through, or to project toward the site (see *Figure 4, Geologic Hazards and Faults Map*). Therefore, the potential for surface rupture due to faulting occurring beneath the site during the design life of the proposed project is considered very low.

7.2 Ground Shaking

The site is located in a seismically active area, as is the majority of Southern California. The most significant seismic hazard at the site is considered to be shaking caused by an earthquake occurring on a nearby or distant active fault. Design considerations for the hazard of seismic shaking are presented in *Section 8.4, Seismic Design Parameters*.

7.3 Liquefaction and Dynamic Settlement

Liquefaction of soils can be caused by ground shaking during earthquakes. Research and historical data indicate that loose, relatively clean granular soils are susceptible to liquefaction and dynamic settlement, whereas the stability of the majority of clayey silts, silty clays and clays is not adversely affected by ground shaking. Liquefaction is generally known to occur in saturated cohesionless soils at depths shallower than approximately 50 feet. Dynamic settlement due to earthquake shaking can occur in both dry and saturated sands.

The project site is underlain by thin layers of fill overlying dense to very dense formational materials. Based on the dense nature of the formational materials, the site is not considered to be susceptible to liquefaction. Therefore, the potential for liquefaction and associated ground deformation occurring beneath the project site is considered low.

7.4 Expansive Soils

The pump station site is underlain by clayey sands with an abundance of gravel. Based on laboratory testing, the Expansion Index of the near surface soils is "very low".

7.5 Flooding

Based on review of San Diego County Flood Rate Insurance Map for the area, the site is not located within a special flood hazard area. Therefore, this site is not subject to inundation by the 1% annual chance flood (i.e. 100-year flood).

8. DESIGN RECOMMENDATIONS

8.1 General

Based on the results of the field exploration and engineering analyses, it is VOE's opinion that the proposed project is feasible from a geotechnical standpoint, provided that the recommendations in this report are incorporated into the design plans and implemented during construction.

The following sections present detailed recommendations and parameters pertaining to the geotechnical engineering design for this project.

8.2 Site Earthwork

Clearing and Grubbing

Prior to grading, the project area should be cleared of all rubble, trash, debris, etc. Any buried organic debris or other unsuitable contaminated material encountered during subsequent excavation and grading work should also be removed.

Excavations for removal of any existing footings, utility lines, tanks, and any other subterranean structures should be processed and backfilled in the following manner:

1. Clear the excavation bottom and sidecuts of all loose and/or disturbed material.

2. Prior to placing backfill, the excavation bottom should be moisture conditioned to within 2 percent of the optimum moisture content and compacted to at least 90 percent of the ASTM D-1557 laboratory test standard.

3. Backfill should be placed, moisture conditioned (i.e., watered and/or aerated as required and thoroughly mixed to a uniform, near optimum moisture content), and compacted by mechanical means in approximate 6-inch lifts. The degree of compaction obtained should be at least 90 or 95 percent of the ASTM D-1557 laboratory test standard, as applicable.

It is also critical that any surficial subgrade materials disturbed during initial demolition and clearing work be removed and/or recompacted in the course of subsequent site preparation earthwork operations.

Site Grading

In order to create uniform subgrade support conditions for the pump station foundations and driveway, the following earthwork operations are recommended:

Pump Station Structure Foundations

- Soils within the footprint of the pump station should be over-excavated a minimum of 1 foot below the bottom of the foundations. All bottoms of over-excavations should be scarified a minimum of 8 inches, moisture conditioned to within 2 percent of the optimum moisture content, and compacted to at least 90 percent of the maximum dry density per ASTM D-1557 test method. The bottom of over-excavations should be inspected and tested prior to the placement of any compacted fill materials.

- The resulting over-excavations should be backfilled with clean soils with an EI less than 20 and maximum rock size of 3-inches. The backfill placed should be compacted to at least 90 percent relative compaction. In addition to the relative compaction requirements, all fills shall be compacted to a firm unyielding condition.

- Import soils if required, should be sampled, tested, and approved prior to arrival on site. Imported and on-site shall consist of clean soils (EI of 20 or less), free from vegetation, debris, or rocks larger than 3 inches maximum dimension.

Asphalt Driveway and Concrete Flatwork

- All asphalt and concrete flatwork areas should be over-excavated a minimum of 1 foot below the bottom of the subgrade elevation. All bottoms of over-excavations should be scarified a minimum of 8 inches, moisture conditioned to within 2 percent of the optimum moisture content, and compacted to at least 95 percent of the maximum dry density per ASTM D-1557 test method. The bottom of over-excavations should be inspected and tested prior to the placement of any compacted fill materials.

- The resulting over-excavations should be backfilled with clean soils with an EI less than 20 and maximum rock size of 3-inches. The backfill placed should be compacted to at least 95 percent relative compaction. In addition to the relative compaction requirements, all fills shall be compacted to a firm unyielding condition.

- Import soils if required, should be sampled, tested, and approved prior to arrival on site. Imported and on-site shall consist of clean soils (EI of 20 or less), free from vegetation, debris, or rocks larger than 3 inches maximum dimension.

8.3 Foundation Design

Shallow spread foundation systems may be used for support of the proposed pump station facilities. The foundations for each structure should be supported entirely on compacted fill (Note: Pump Station Building) prepared in accordance with the earthwork recommendations in Section 8.2 or entirely on competent undisturbed formational material (Note: Pump Cans).

8.3.1 Foundation Design Parameters

Shallow spread foundations should be designed using the geotechnical design parameters presented in *Table 1* below. In addition, footings should be designed and reinforced in accordance with the recommendations of the structural engineer and should conform to the 2013 California Building Code.

Table 1: Spread Footing Parameters

Foundation Dimensions	At least 12 inches in width; at least 12 inches below the lowest adjacent grade.
Allowable Bearing Capacity (dead-plus-live load)	Compacted Fill or Formation: 2,500 pounds per square foot (psf) The allowable bearing value may be increased by one-third for transient live loads from wind or seismic.
Estimated Static Settlement (Total/Differential)	<1-inch total & < ½-inch in 40 feet differential
Allowable Coefficient of Friction	Compacted Fill or Formation: 0.35
Allowable Lateral Passive Resistance	Compacted Fill or Formation: 300 pounds per cubic foot (pcf; EFP) A one-third increase may be used for wind or seismic loads. The passive resistance of the materials may be combined with the frictional resistance provided the passive component does not exceed two-thirds of the total lateral resistance.

8.3.2 Settlement

Estimated settlements will depend on the foundation size and depth, the loads imposed, and the bearing values. For preliminary design purposes, the total settlement for spread footings for the proposed structures is estimated to be on the order of less than 1 inch.

Differential settlements will depend on the foundation size and depth, and the loads imposed. However, based on our knowledge of the project, differential settlements are anticipated to be 0.50 inches or less in 40 feet. In any case, comprehensive settlement analyses will need to be performed when detailed foundation load information is available to evaluate total and differential settlement.

8.3.3 Lateral Loads

Lateral loads may be resisted by friction and by the passive resistance of the supporting soils. A coefficient of friction of 0.35 may be used between foundations/slabs and soil. In the event that a vapor barrier is employed, a reduced coefficient of friction of 0.10 should be used for these slab-on-grade areas. The passive resistance of the soils may be assumed to be equal to the pressure developed by a fluid with a density of 300 pounds per cubic foot (pcf). A one-third increase in the passive value may be used for wind or seismic loads. The passive resistance of the materials may be combined with the frictional resistance provided the lateral bearing resistance does not exceed two-thirds of the total lateral resistance.

8.3.4 Foundation Observation

To verify the presence of satisfactory materials at design elevations, footing excavations should be observed to be clean of loosened soil and debris before placing steel or concrete and probed for soft areas. If soft or loose soils or unsatisfactory materials are encountered, these materials should be removed and may be replaced with a two-sack, sand-cement slurry or structural concrete. Footing excavations should be deepened as necessary to extend into satisfactory bearing materials; however, VOE should be notified to check the proposed changes.

8.4 Seismic Design Parameters

Seismic design parameters for the project site were developed as per the guidelines outlined in the 2013 California Building Code, Volume 2, Chapter 16. The seismic design parameters for Site Class "C" were developed using a JAVA ™ application, Java Ground Motion Parameter Calculator–Version 5.0.9 available on the USGS website (http://earthquake.usgs.gov). The seismic design parameters for the substation expansion project are presented in *Table 2* below.

Table 2: 2013 California Building Code Seismic Parameters

2013 CBC Seismic Design Parameters	Value
Site Class Definition; (Table 1613.5.5.)	C
Mapped Spectral Accelerations for short periods, S_S; (Section 1613.5.1.)	0.899g
Mapped Spectral Accelerations for 1-sec period, S_1; (Section 1613.5.1.)	0.345g
Site Coefficient, F_a; (Table 1613.5.3(1).)	1.040
Site Coefficient, F_v; (Table 1613.5.3(2).)	1.455
Maximum considered earthquake spectral response acceleration for short periods, S_{MS} adjusted for Site Class (Equation 16-37)	0.935g
Maximum considered earthquake spectral response acceleration at 1-sec period, S_{M1} adjusted for Site Class (Equation 16-38)	0.502g
Five-percent damped design spectral response acceleration at short periods, S_{DS}; (Section 1613.5.4.)	0.624g
Five-percent damped design spectral response acceleration at 1-sec period, S_{D1}; (Section 1613.5.4.)	0.335g

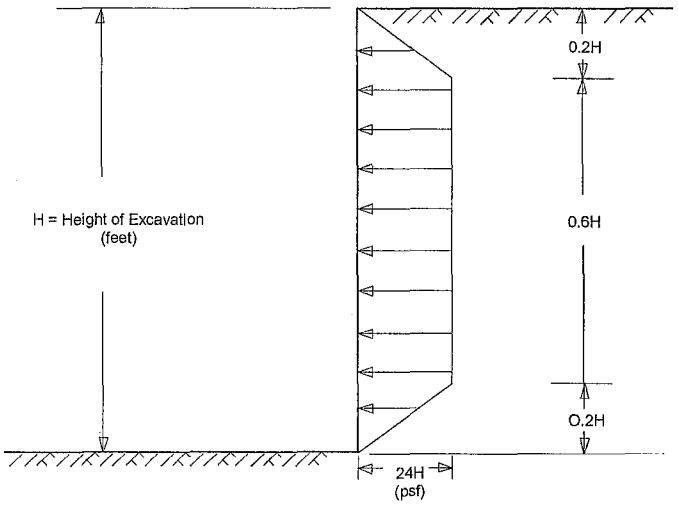
8.5 Temporary Excavations

Excavation of the on-site materials may be achieved with conventional heavy-duty grading equipment within the fill and formational materials to a depth of about 7 feet below existing grades on the western portion of the project and to a depth of about 10 feet on the eastern portion of the project. **However, difficulties excavating below these depths should be anticipated due to very dense gravels.** Special excavating equipment will likely be necessary. Temporary, shallow excavations with vertical side slopes less than 4 feet high will generally be stable, although there is a potential for localized sloughing. Vertical excavations greater than 4 feet high should not be attempted without proper shoring to prevent local instabilities. Shoring may be accomplished with hydraulic shores and trench plates, and/or trench boxes, soldier piles and lagging. The actual method of a shoring system should be provided and designed by a contractor

experienced in installing temporary shoring under similar soil conditions. If soldier piles and lagging are to be used, we should be contacted for additional recommendations.

All trench excavations should be shored in accordance with CalOSHA regulations. For your planning purposes, the on-site fill and formation materials may be considered a Type C and Type B soil, respectively, as defined by the current CalOSHA soil classification.

Braced excavations should be designed to resist a trapezoidal distribution of lateral earth pressure. The recommended pressure distribution, for the case where the grade is level behind the shoring, is illustrated in the following diagram with the maximum pressure equal to 24H in psf, where H is the height of the excavation in feet.



Any surcharge (live, including traffic, or dead load) located within a 1(H): 1 (V) plane drawn upward from the base of the shored excavation should be added to the lateral earth pressures. The lateral load contribution of a uniform surcharge load located across the 1(H): 1(V) zone behind the excavation walls may be calculated by using *Figure 5, Lateral Surcharge Loads*. Lateral load contributions of surcharges can be provided once the load configurations and layouts are known. As a minimum, a 2-foot equivalent soil surcharge is recommended to account for nominal construction loads.

Stockpiled (excavated) materials should be placed no closer to the edge of a trench excavation than a distance defined by a line drawn upward from the bottom of the trench at an inclination of 1(H): 1(V), but no closer than 4 feet. All trench excavations should be made in accordance with CalOSHA requirements.

8.6 Retaining Walls

The following sections are provided in connection with the design and construction of retaining walls.

8.6.1 Lateral Earth Pressure

Retaining walls should be designed to resist a triangular distribution of lateral earth pressure plus surcharges from any adjacent loads. The recommended lateral earth pressures for retaining walls free to rotate, with level, 1.5:1 (H:V), and 2:1 (H:V) slope

backfills, are 40, 60 and 55 pounds per cubic foot (equivalent fluid pressure), respectively. For restrained walls, at-rest lateral equivalent fluid pressures of 60, 75, and 70 pounds per cubic foot may be used. Simple surface surcharge pressures and point loads should be added to the active pressure contribution from the backfill. The geotechnical engineer should check the lateral magnitude and distribution resulting from surcharge loads.

The recommended earth pressure is calculated assuming that a drainage system will be installed behind the retaining walls, so that external water pressure will not develop.

8.6.2 Seismic Lateral Earth Pressure

In addition to the above-mentioned lateral earth pressures, walls more than 6 feet in height should be designed to support a seismic active pressure. The recommended seismic active pressure distribution on the retaining and basement walls is an inverted triangular with the maximum pressure equal to 24H and 36H psf, respectively, where H is the differential wall height in feet.

8.6.3 Drainage

Retaining walls should be properly drained. Adequate backfill drainage is essential to provide a free-drained backfill condition and to limit hydrostatic buildup behind walls. In addition, drainage behind retaining walls along on-site cut slopes should provide a relief to the potential seepage from the cut slope irrigation water

Retaining walls should be appropriately waterproofed. Drainage behind the retaining walls may be provided with a geosynthetic drainage composite such as TerraDrain, MiraDrain, or equivalent, attached to the outside perimeter of the wall. The drain should be placed continuously along the back of the wall and connected to a 4-inch-diameter perforated pipe. The pipe should be sloped at least 2% and surrounded by 3 cubic feet per foot of ¾-inch crushed rock wrapped in suitable non-woven filter fabric (Mirafi 140N or equivalent) or Caltrans Class 2 permeable granular filter materials without filter fabric. The crushed rock should meet the requirements defined in Section 200-1.2 of the latest edition of the Standard Specification for Public Works Construction (Greenbook). These drains should be connected to an adequate discharge system.

8.6.4 Backfill

Any retaining wall backfill material should be non-expansive (E.I. of 20 or less) and free draining. Wall backfill should be moisture conditioned to about 1 to 3 percent above optimum moisture content, and compacted in 8-inch lifts to at least 90 percent relative compaction (ASTM D1557). Backfill within the upper foot of subgrade areas should be compacted to at least 95 percent of the aforementioned standard.

8.7 Utility Trench Backfill

All subsurface utility trench backfill should be mechanically compacted. Water jetting should not be used for compaction. The pipe bedding and cover (Note: minimum 6-inches bedding and 12-inches cover) should consist of free-draining sand or small gravel with a minimum sand

equivalent of 30 (e.g., ASTM C-33 concrete sand). There should be sufficient clearance along the side of the utility pipe or line to allow for compaction equipment. The pipe bedding shall be compacted under the haunches and alongside the pipe. All trench backfill should be compacted to at least 90 percent relative compaction, with the upper foot underlying concrete or pavement compacted to at least 95 percent based on the latest version of the ASTM D1557 test procedure. In lieu of compacted backfill utility line trenches may be backfilled with 2-sack cement sand slurry up to 12-inches below the finished pad surface.

8.8 Thrust Forces

If thrust blocks are used, the blocks may be designed using a passive resistance equal to an equivalent fluid pressure of 300 pounds per cubic foot (pcf). See *Figure 6, Thrust Block* to determine the resultant passive pressure for a thrust block.

8.9 Vertical Pressures

Loads exerted on the pipes should not exceed the manufacturer's recommendations. VOE has provided the following tables as estimates of the vertical pressures. If more specific pressures are needed at spot locations, VOE may be contacted for more in depth analysis.

Table 3: Design Vertical Pressures (soil) (1)

Depth of Cover (feet)	D (psf)
0-5	650
6-10	1,300

(1) Dead load vertical pressure from soil prism considering load coefficients for cohesionless backfill.

Table 4: Design Vertical Pressures (Dynamic Loads) (1)

Depth of Cover (feet)	D (psf)
2	3,200
4	1,150
6	600
8	360
10	240

(1) Dead load vertical pressure equivalent based on a dynamic load from a truck with a contact pressure of 100 psi.

8.10 Pavement

8.10.1 Flexible Asphalt Concrete Pavements

To develop preliminary recommendations for the proposed pavement sections at the pump station site, an R-value test was performed on a sample obtained from near surface soils (Note: B-7 @ 1-4 feet). An R-value of 16 was obtained and, therefore, a value of 15 was considered appropriate for preliminary design purposes. Pavement sections

corresponding to traffic index values ranging from 5.0 to 7.0 are presented in *Table 5* below. The project civil engineer should select the appropriate pavement section based on the anticipated traffic conditions. Based on these design parameters, analysis in accordance with the current *Cal-Trans Highway Design Manual*, and assuming compliance with site preparation recommendations, VOE recommends the following pavement structural sections:

Table 5: Asphalt Concrete Pavement Sections

Traffic Index (TI)	Typical R-Value = 15 Pavement Section			
	AC [1] (inches)	AB [2] (inches)	AB [3] (inches)	AB [4] (inches)
5.0	3.0	8.0	6.5	5.0
5.5	3.5	9.0	7.5	6.0
6.0	4.0	9.0	7.5	6.5
6.5	4.5	10.5	7.5	7.0
7.0	5.0	11.0	8.0	7.5

(1) Asphalt Concrete.
(2) Crushed Aggregate Base (CAB), Green Book section 200-2.2, compacted to at least 95% relative compaction (ASTM D-1557).
(3) Aggregate Base section utilizing Tensar BX 1100 geogrid installed at the design subgrade elevation.
(4) Aggregate Base section utilizing Tensar BX 1200 geogrid installed at the design subgrade elevation.
Note: The upper 12-inches of subgrade soils should be compacted to at least 95% relative compaction (ASTM D-1557).

It is recommended that R-value testing be performed on representative soil samples after rough grading operations on the upper 2-feet to check applicability of the above pavement sections. The upper 12 inches of subgrade soils should be compacted to a minimum dry density of 95% of the materials' maximum density as determined by the ASTM D1557 test procedure.

The aggregate base should conform to the Crushed Aggregate Base per Greenbook requirements, Section 200-2.2. The base course should be compacted to at least 95% relative compaction. Field and lab testing should be used to check compaction, aggregate gradation, and compacted thickness.

The asphalt concrete pavement should be compacted to 95% of the unit weight as tested in accordance with the Hveem procedure. The maximum lift thickness should be 2.0 inches. The asphalt concrete material shall conform to Type III, Class C2 or C3, 2001 edition of the Greenbook Standard Specifications for Public Works Construction. An approved mix design should be submitted 30 days prior to placement. The mix design should include proportions of materials, maximum density and required lay-down temperature range. Field and lab testing should be used to verify oil content, aggregate gradation, compaction, compacted thickness, and lay-down temperature.

If the paved areas are to be used during construction, or if the type and frequency of traffic is greater than assumed in the design, the pavement section should be re-evaluated for the anticipated traffic.

8.10.2 Rigid Portland Cement Concrete

Recommendations for Portland Cement Concrete (PCC) pavement structural sections are shown in *Table 6* below.

Table 6: Rigid Portland Cement Concrete Pavement Sections

Average Daily Truck Traffic[1] (ADTT)	Modulus of Subbase Reaction[2] (k; pci)	PCC Pavement Thickness[3] (inches)	AB Thickness[4] (inches)
1	150	4.0	6
10	150	5.5	6
25	150	5.5	6
100	150	6.0	6

(1) ADTT values have been assumed for planning purposes and should be confirmed by the design team during future plan development.
(2) Effective modulus at the finished rock base elevation considering subgrade soils and overlying rock base section;
(3) Concrete shall have a minimum modulus of rupture $M_R \geq 550$ psi based on ASTM C78. This analysis assumes the construction of concrete shoulders. Slabs should be reinforced with No.3 reinforcing bars at 18 inches on center in both horizontal directions.
(4) Crushed Aggregate Base (CAB), Green Book section 200-2.2 or Caltrans Class 2, compacted to at least 95% relative compaction (ASTM D-1557).

Stresses are anticipated to be greater at the edges and construction joints of the pavement section. A thickened edge is recommended on the outside of slabs subject to wheel loads. Control joints should be provided at maximum of 15 feet spacing each way. Installation of these types of joints should be made immediately after concrete finishing. Construction jointing, doweling, and reinforcing should be provided in accordance with recommendations of the ACI.

Subgrade soil should be compacted to a minimum of 95 percent relative compaction for pavement constructed over low to medium expansive soils. Crushed Aggregate Base (CAB) should conform to section 200-2.2 of the *Standard Specifications for Public Works Construction "Greenbook"* and should be compacted to a minimum of 95 percent of the maximum dry density at near optimum moisture content.

Rigid Portland cement concrete sections were evaluated using methods suggested by the *American Concrete Institute – Guide for Design and Construction of Concrete Parking Lots* (ACI 330R-92).

The performance of pavements is highly dependent upon providing positive surface drainage away from the edge of the pavement. The ponding of water on or adjacent to pavement areas will likely cause failure of the subgrade and resultant pavement distress. Where planters are proposed, the perimeter curb should extend at least 6 inches below the subgrade elevation of the adjacent pavement. In addition, our experience indicates that even with these provisions, a saturated subgrade condition can develop as a result of increased irrigation, landscaping and surface runoff. A subdrainage system should be constructed along the perimeter of pavement subgrade areas to reduce the potential of this condition developing. The subdrain system should be

designed to intercept irrigation water and surface runoff prior to entry into the pavement subgrade and carry the water to a suitable outlet.

8.11 Soil Corrosion

The corrosion potential of the on-site materials to steel and buried concrete was evaluated. Laboratory testing was performed on representative samples of the existing soil materials to evaluate pH, minimum resistivity, and chloride and soluble sulfate content. *Table 7* below presents the results of our corrosivity testing. General recommendations to address the corrosion potential of the on-site materials will be provided by the corrosion specialists RF Yeager Engineering.

Table 7: Corrosion Test Data

Boring No.	Depth (feet)	pH	Resistivity (ohm-cm)	Chloride Content (ppm)	Sulfate Content (ppm)
B-1	4-6	6.8	670	40	130
B-6	5-6	6.4	720	30	20
B-7	5-6	6.0	1300	20	40
B-9	8-10	8.9	690	20	20
B-10	8-10	9.1	920	30	40

9. CONSTRUCTION CONSIDERATIONS

Construction considerations for the proposed improvements are presented below.

1. The structure foundation excavations should be observed by the engineer during excavation to verify that they extend to the recommended elevations or deeper.

2. Groundwater is not anticipated to affect the proposed construction. However, if construction activities extend to about 34 feet below grade on the western portion of the project and about 60 feet below grade on the eastern portion of the project, groundwater may be encountered. Very moist soils were encountered at about 10 feet within Boring B-6 and B-9. These moist soils may indicate a localized seepage zone. In addition, periodic ground water seepage zones and ground water mounding should be anticipated during the wet weather season.

3. During the geotechnical borings, refusal was encountered within very dense gravels at 7 feet below the existing grade within B-1 at the western portion of the alignment. Refusal within very dense gravels was also encountered at about 10 feet below existing grade within the pump station site. The contractor should anticipate difficulties excavating below these depths.

4. Temporary excavations may be required for removal and/or installation of underground elements. The Occupational Safety and Health Administration (OSHA) regulations provide trench sloping and

shoring design parameters for excavations up to 20-feet deep, based on a description of the soil types encountered. VOE recommends that a Type C and Type B OSHA Classifications be used for temporary excavations within fill and formational materials, respectively. Excavations should be inspected by the engineer and the performance evaluated.

5. All fills should be compacted to at least 90 or 95 percent relative compaction, as applicable, based on the ASTM D-1557 laboratory test method.

6. If materials at the bottom of receiving subgrades and/or any excavations are disturbed during construction activities, they should be removed and recompacted to a minimum 90 percent relative compaction, based on ASTM D-1557.

10. LIMITATIONS

The recommendations and opinions expressed in this report are based on VOE's review of background documents and on information developed during this study. More detailed limitations of the geotechnical engineering report are presented in the ASFE's information bulletin in *Appendix C*.

Due to the limited nature of our field explorations, conditions not observed and described in this report may be present on the site. Uncertainties relative to subsurface conditions can be reduced through additional subsurface exploration. Additional subsurface evaluation and laboratory testing can be performed upon request. It should be understood that conditions different from those anticipated in this report may be encountered during substation expansion construction operations.

Site conditions, including ground-water level, can change with time as a result of natural processes or the activities of man at the subject site or at nearby sites. Changes to the applicable laws, regulations, codes, and standards of practice may occur as a result of government action or the broadening of knowledge. The findings of this report may, therefore, be invalidated over time, in part or in whole, by changes over which VOE has no control.

VOE's recommendations for this site are, to a high degree, dependent upon appropriate quality control of subgrade preparation, fill placement, and foundation construction. Accordingly, the recommendations are made contingent upon the opportunity for VOE to observe grading operations and foundation excavations for the proposed construction. If parties other than VOE are engaged to provide such services, such parties must be notified that they will be required to assume complete responsibility as the geotechnical engineer of record for the geotechnical phase of the project by concurring with the recommendations in this report and/or by providing alternative recommendations.

This document is intended to be used only in its entirety. No portion of the document, by itself, is designed to completely represent any aspect of the project described herein. VOE should be contacted if the reader requires additional information or has questions regarding the content, interpretations presented, or completeness of this document.

VOE has endeavored to perform this study using the degree of care and skill ordinarily exercised under similar circumstances by reputable geotechnical professionals with experience in this area in similar soil/rock conditions. No other warranty, either expressed or implied, is made as to the conclusions and recommendations contained in this study.

11. REFERENCES

1. ASTM, 2001, Soil and Rock: American Society for Testing and Materials: vol. 4.08 for ASTM test methods D-420 to D-4914; and vol. 4.09 for ASTM test methods D-4943 to highest number;

2. ASTM, 2001, Geotechnical Engineering Standards: American Society for Testing and Materials: and ASTM test method D-7012;

3. California Department of Conservation, Division of Mines and Geology, 1997, Guidelines for Evaluation and Mitigation of Seismic Hazards in California: Special Publication 117;

4. California Department of Conservation, Division of Mines and Geology, 1998, Maps of Known Active Fault Near-Source Zones in California and Adjacent Portions of Nevada: International Conference of Building Officials, dated February ,Scale 1" = 4 km;

5. Civiltech Software, LiquefyPro, Version 5.8, 2007-3, Liquefaction and Settlement Analysis Software Manual;

6. Electric Power Research Institute (EPRI), EL-2197, Volume 1, Laterally Loaded Drilled Pier Research, Section 3, Laterally Loaded Drilled Pier Design;

7. EPRI, EL-6800, Figure 5-18, Manual on Estimating Soil Properties for Foundation Design;

8. Hunt, Roy E., 1986, Geotechnical Engineering Analysis and Evaluation;

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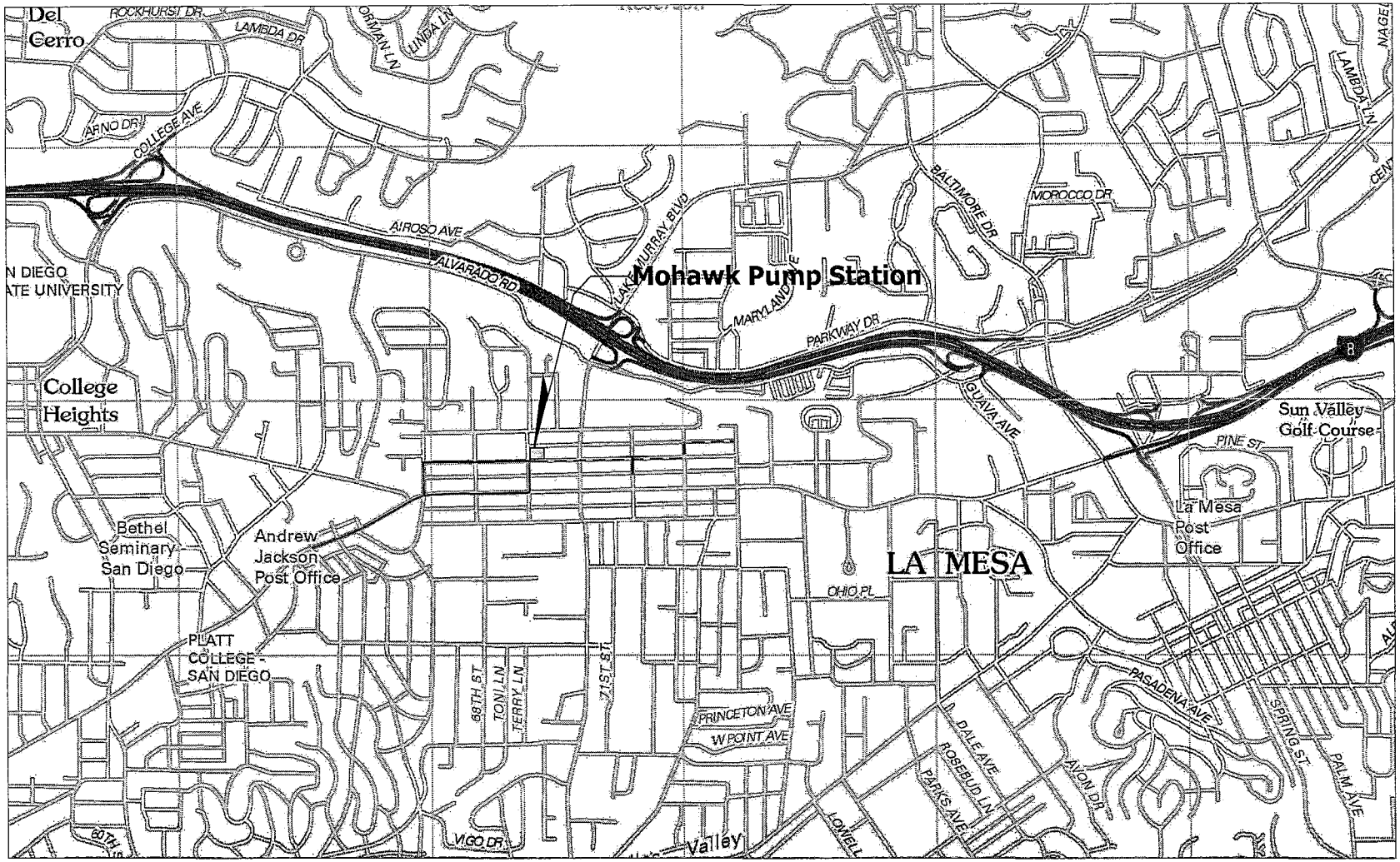
12. Lee, L.J., 1977, Potential foundation problems associated with earthquakes in San Diego, in Abbott, P.L., and Victoria, J.K., eds., Geologic Hazards in San Diego, Earthquakes, Landslides, and Floods: San Diego Society of Natural History John Porter Dexter Memorial Publication;

13. Macnab, A., 2002, Earth Retention Systems Handbook;

14. Schnabel, H. Jr., 1982, Tiebacks in Foundation Engineering and Construction;

Figures

Prepared by VO Engineering



Reference: USGS 2009 Topographic Map (La Mesa, CA - 7.5 minute Quadrangle)

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Legend

——— Proposed Water Main
– – – Abandoned Pipe

Vicinity Map

City of San Diego Mohawk Pump Station

Project No.: V-0322-G | **Figure No.: 1**

Mohawk Pump Station

N
No Scale

Reference: Google Earth

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Legend

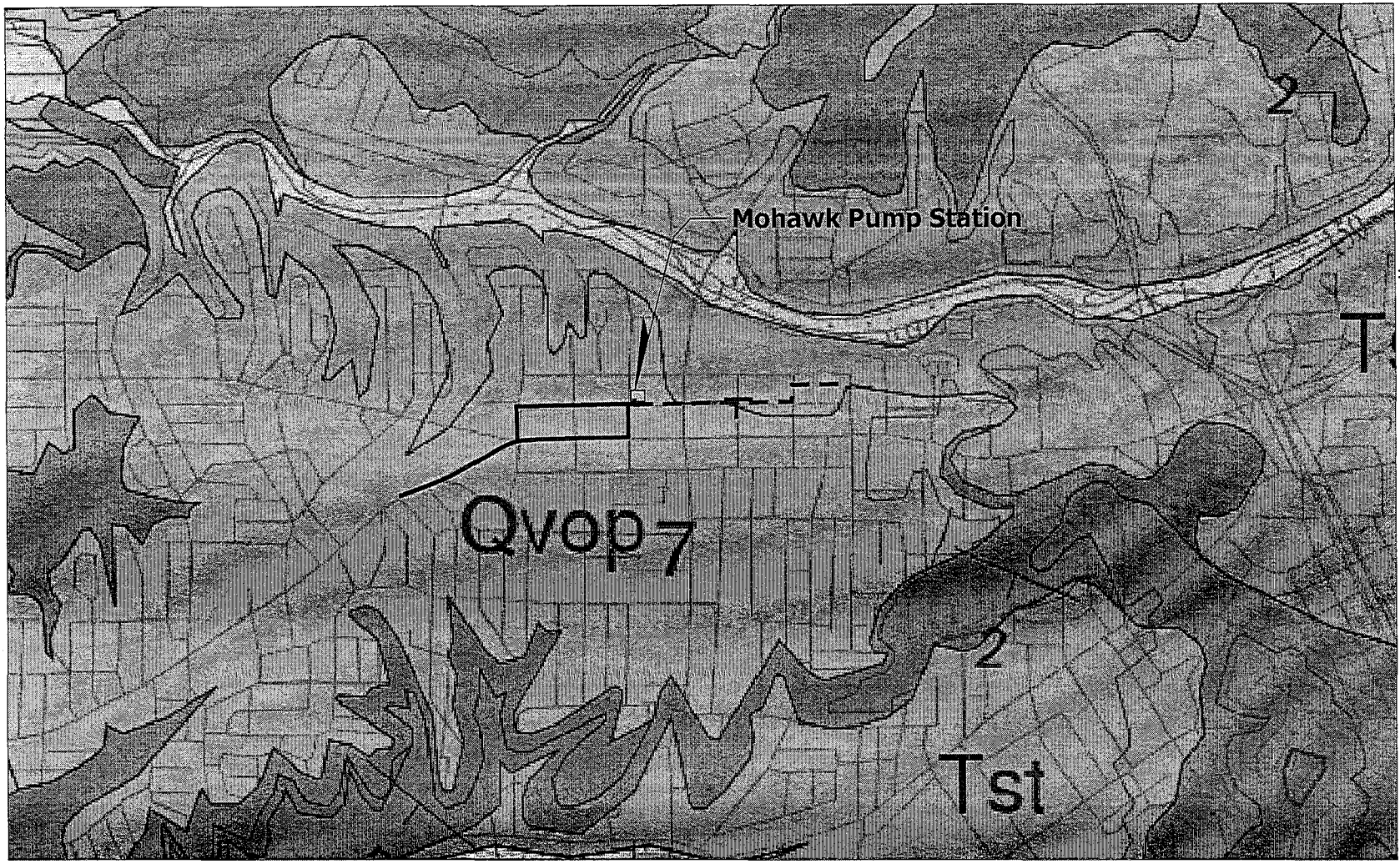
B-10 Approximate Boring Location

Proposed Water Main

Plot Plan

City of San Diego Mohawk Pump Station

Project No.: V-0322-G | **Figure No.: 2**



Reference: USGS 2005 Geologic Map (San Diego, CA - 30 x 60 minute Quadrangle)

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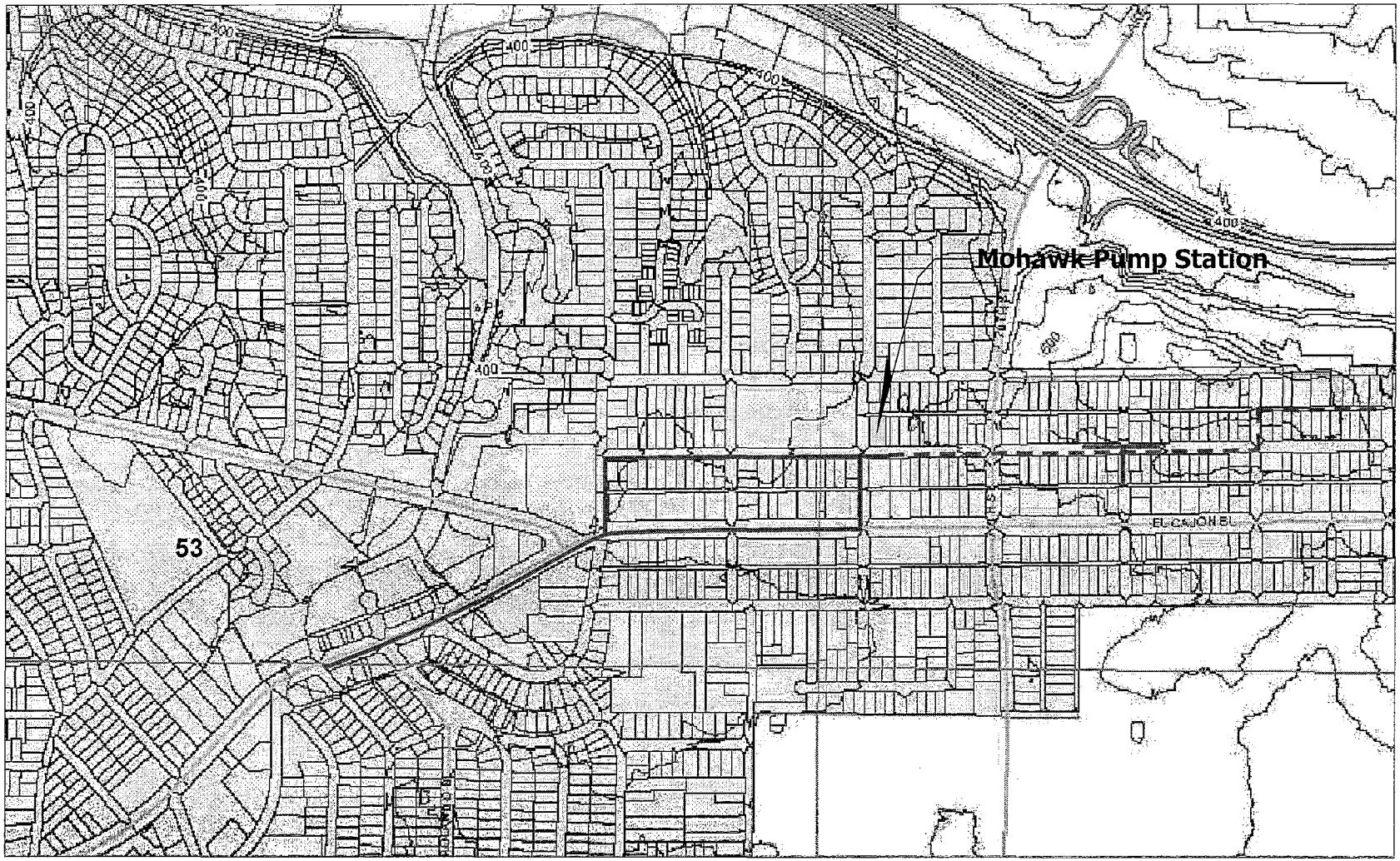
Legend

- Proposed Water Main
- Abandoned Pipe
- $Qvop_7$: Very old paralic deposits (Unit 7)
- Tst: Stadium Conglomerate

Regional Geology Map

City of San Diego Mohawk Pump Station

Project No.: V-0322-G | **Figure No.: 3**



Reference: City of San Diego Seismic Safety Study, Geologic Hazards and Faults, 2008

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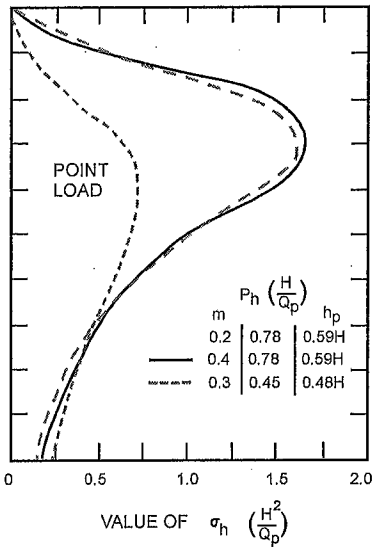
Legend

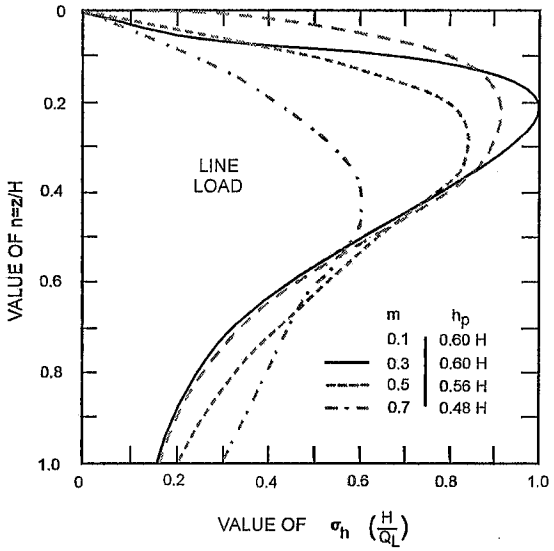
- Proposed Water Main
- Abandoned Pipe
- 53 - Level or sloping terrain, unfavorable geologic structure, low to moderate risk

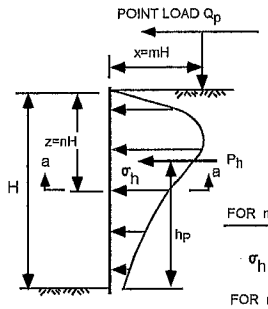
Seismic Hazards & Faults

City of San Diego Mohawk Pump Station

Project No.: V-0322-G	Figure No.: 4







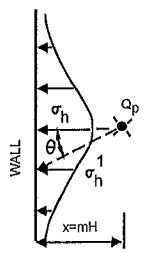
FOR m ≦ 0.4 :

$$\sigma_h\left(\frac{H^2}{Q_p}\right) = \frac{0.28\,n^2}{(0.16+n^2)^3}$$

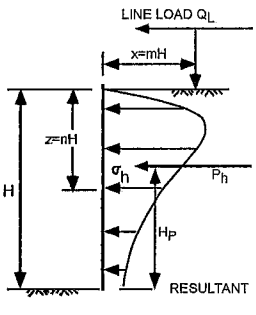
FOR m > 0.4 :

$$\sigma_h\left(\frac{H^2}{Q_p}\right) = \frac{1.77\,m^2n^2}{(m^2+n^2)^3}$$

$$\sigma_h^1 = \sigma_h \cos 2(1.1\theta)$$



SECTION a ~a
PRESSURE FROM POINT LOAD Q_p
(BOUSSINESQ EQUATION MODIFIED BY EXPERIMENT)



FOR m ≦ 0.4 :

$$\sigma_h\left(\frac{H}{Q_L}\right) = \frac{0.20\,n}{(0.16+n^2)^2}$$

$P_H = 0.55\,Q_L$

FOR m > 0.4 :

$$\sigma_h\left(\frac{H}{Q_L}\right) = \frac{1.28\,m^2n}{(m^2+n^2)^2}$$

RESULTANT $P_H = \frac{0.64\,Q_L}{(m^2+1)}$

PRESSURE FROM LINE LOAD Q_L
(BOUSSINESQ EQUATION MODIFIED BY EXPERIMENT)

Reference: Navfac, DM 7.02, Chapter 3, Analysis of Walls and Retaining Structures, Figure 11, Horizontal Pressures on Rigid Wall from Surface Loads, pg. 7.2.74, September, 1986.

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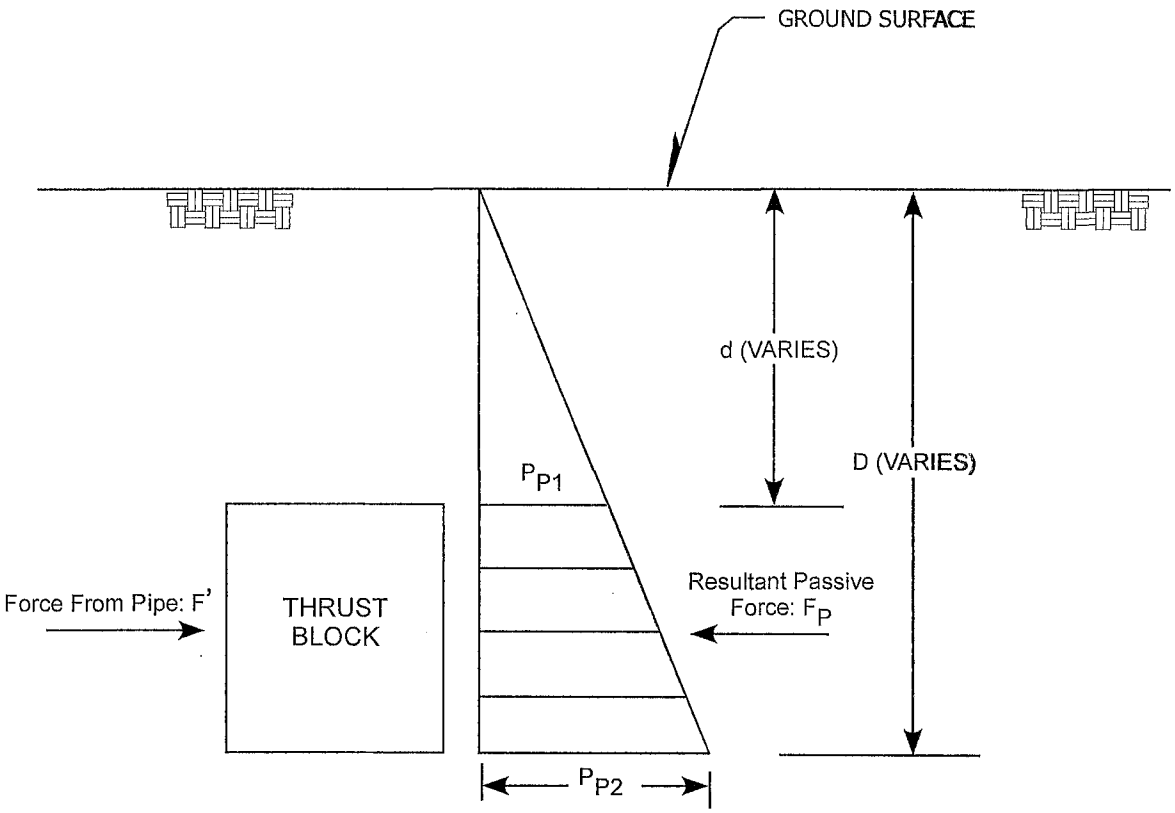
Lateral Surcharge Loads

City of San Diego Mohawk Pump Station

Project No.: V-0322-G | **Figure No.: 5**



Notes (For Groundwater Below Thrust Block):

1. $P_{P1} = 300d$ lb/ft^2
2. $P_{P2} = 300D$ lb/ft^2
3. $F_P = \frac{300}{2}(D^2-d^2)$ lb/ft
4. Assumes Backfill is Granular Material
5. Assumes Thrust Block is Adjacent to Competent Material
6. D and d are in Feet

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Thrust Block

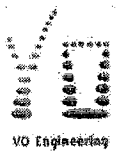
City of San Diego Mohawk Pump Station

Project No.: V-0322-G	**Figure No.: 6**

Appendix A

Exploratory Boring Logs

Prepared by VO Engineering



LOG SYMBOLS:

Bulk/Bag sample

Modified California sampler
(2-1/2 inch outside diameter)

California sampler
(3 inch outside diameter)

Standard penetration
Split spoon sampler
(2 inch outside diameter)

NX size core barrel
(2-5/8 inch outside diameter)

Shelby tube

Water level
(level after completion)

Water level
(level where first encountered)

Abbreviations:

SA - Sieve Analysis
WA - Wash (Percent passing #200 sieve)
PI - Plasticity index
LL - Liquid limit
DS - Direct shear test
'R' - R-value test
CORR - Corrosivity test
EI - UBC expansion index
LC - Laboratory compaction test

General Notes:

1. Lines separating strata on the logs represent approximate boundaries only. Actual transitions may be gradual.
2. No warranty is provided as to the continuity of soil conditions between individual sample locations.
3. Logs represent general soil conditions observed at the point of exploration on the date indicated.
4. In general, unified soil classification designations presented on the logs were evaluated by visual methods only. Therefore, actual designations (based on laboratory tests) may vary.

Consistency criteria based on field tests

Relative Density (Sands & Gravels)	SPT(1) (# blows/ft)	Relative Density (%)
Very Loose	<4	0 - 15
Loose	4 - 10	15 - 35
Medium Dense	10 - 30	35 - 65
Dense	30 - 50	65 - 85
Very dense	>50	85 - 100

		Torvane	Pocket(2) Penetrometer
Consistency (Clays & Silts)	SPT(1) (# blows/ft)	Undrained Shear Strength (tsf)	Unconfined Compressive Strength
Very soft	<2	<0.13	<0.25
Soft	2 - 4	0.13 - 0.25	0.25 - 0.5
Medium stiff	4 - 8	0.25 - 0.5	0.5 - 1.0
Stiff	8 - 15	0.5 - 1.0	1.0 - 2.0
Very stiff	15 - 30	1.0 - 2.0	2.0 - 4.0
Hard	>30	>2.0	>4.0

(1) Number of blows of 140 pounds hammer falling 30 inches to drive a 2 inch O.D. split barrel sampler 1 foot (ASTM D1586). The number of blows for a California Modified Sampler (3.0 inch O.D.) should be multiplied by 0.6.

(2) Unconfined compressive strength in Tons/ft^2. Read from pocket penetrometer.

Moisture content

Description	Field test
Dry	Absence of moisture, dusty, dry to the touch
Moist	Damp but no visible water
Wet	Visible free water, usually soil is below water table

Cementation

Description	Field test
Weakly	Crumbles or breaks with handling or slight finger pressure
Moderately	Crumbles or breaks with considerable finger pressure
Strongly	Will not crumble or break with finger pressure

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Log Legend

City of San Diego Mohawk Pump Station

Project No.: V-0322-G | **Figure No.: A-1**

Boring Log No. 1

Date Drilled: 8-18-2014 | **Exploratory Equipment: Diedrich D-50**

Driving Weight: 140 lbs - 30" drop | **Surface Elevation: 460 ft MSL**

Depth in Feet	Driven Sample	N value	Material Description	USCS	Color	Moisture	Consistency	Dry Density (pcf)
			7 inches asphaltic concrete					
			Undocumented Fill (Qaf): Clayey Sand with Gravel.	SC	Dark Brown	Moist	Dense	
			Very Old Paralic Deposits ($Qvop_7$): Silty Sand with abundance of gravel.	SM	Brown	Moist	Very Dense	
5		30 50 3"	Large rock in sampler, no recovery					
		50 3"	No recovery					
			Refusal at 7.5' **Groundwater not encountered**					
10								
15								
20								

Moisture Content (% Dry Weight)

10 20 30 40 50

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Exploratory Boring Logs

City of San Diego Mohawk Pump Station

Project No.: V-0322-G | **Figure No.: A-2**

Boring Log No. 2

Date Drilled: 8-18-2014 | **Exploratory Equipment: Diedrich D-50**

Driving Weight: 140 lbs - 30" drop | **Surface Elevation: 443 ft MSL**

Depth in Feet	Driven Sample	N value	Material Description	USCS	Color	Moisture	Consistency	Dry Density (pcf)	Moisture Content (% Dry Weight) 10 20 30 40 50
			5 inches asphaltic concrete overlying concrete. Moved boring and encountered concrete again.						
			Refusal at 1' **Groundwater not encountered**						
5									
10									
15									
20									

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Exploratory Boring Logs

City of San Diego Mohawk Pump Station

Project No.: V-0322-G | **Figure No.: A-3**

Boring Log No. 3

Date Drilled: 8-18-2014 | **Exploratory Equipment: Diedrich D-50**

Driving Weight: 140 lbs - 30" drop | **Surface Elevation: 458 ft MSL**

Depth in Feet	Driven Sample	N value	Material Description	USCS	Color	Moisture	Consistency	Dry Density (pcf)	Moisture Content (% Dry Weight)
			6 inches asphaltic concrete						
			Undocumented Fill (Qaf): Silty Clay.	CL	Brown	Moist	Stiff		
			Very Old Paralic Deposits ($Qvop_7$): Sandy Clay/Clayey Sand with gravel. Hard drilling at 3' due to gravel.	CL/SC	Brown	Moist	Very Dense		
5		50/3"							
			Clayey Sand with gravel, micaceous, some iron oxide staining	SC			Medium Dense to Dense		
10		24							
		35	fine grained						
15			**End of boring at 14.5'** **Groundwater not encountered**						
20									

Moisture Content (% Dry Weight): 10 20 30 40 50

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Exploratory Boring Logs

City of San Diego Mohawk Pump Station

Project No.: V-0322-G | **Figure No.: A-4**

Boring Log No. 4

Date Drilled: 8-15-2014 | **Exploratory Equipment: Diedrich D-50**

Driving Weight: 140 lbs - 30" drop | **Surface Elevation: 465 ft MSL**

Depth in Feet	Driven Sample	N value	Material Description	USCS	Color	Moisture	Consistency	Dry Density (pcf)
			6.5 inches asphaltic concrete					
			Undocumented Fill (Qaf): Sandy Clay with gravel, fine to medium grained.	CL	Light Brown	Moist	Stiff	
			Very Old Paralic Deposits ($Qvop_7$): Silty Sandstone, trace gravel, fine grained. Dark manganese staining and white calcium carbonate nodules.	SM	Brown	Damp	Very Dense	
5		32 50 3"	Clayey Sand/Sandy Clay, trace gravel, some orange iron oxide staining, weakly to moderately cemented.	SC/CL	Tan			
10		14 50 4"	Clayey Sand with gravel, moderately cemented	SC				
		13 50 2"						
15			**End of boring at 14'** **Groundwater not encountered**					
20								

Moisture Content (% Dry Weight)

10 20 30 40 50

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Exploratory Boring Logs

City of San Diego Mohawk Pump Station

Project No.: V-0322-G | **Figure No.: A-5**

Boring Log No. 5

Date Drilled: 8-15-2014 | **Exploratory Equipment: Diedrich D-50**

Driving Weight: 140 lbs - 30" drop | **Surface Elevation: 465 ft MSL**

Depth in Feet	Driven Sample	N value	Material Description	USCS	Color	Moisture	Consistency	Dry Density (pcf)
			7 inches asphaltic concrete					
			Undocumented Fill (Qaf): Sandy Clay with gravel.	CL	Brown	Moist	Stiff	
			Very Old Paralic Deposits ($Qvop_7$): Sandy Clay with gravel and cobble.	CL	Brown	Damp	Very Dense	
5		30 50 4"	Silty Sandstone, fine grained, some iron oxide staining, slightly cemented.	SM	Tan			120.2
10		30 50 5"	Encountered some cobble-sized rock					119.4
		50 6"						
15			**End of boring at 13.5'** **Groundwater not encountered**					
20								

Moisture Content (% Dry Weight)

10 20 30 40 50

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Exploratory Boring Logs

City of San Diego Mohawk Pump Station

Project No.: V-0322-G | **Figure No.: A-6**

Boring Log No. 6

Date Drilled: 8-15-2014 | **Exploratory Equipment: Diedrich D-50**

Driving Weight: 140 lbs - 30" drop | **Surface Elevation: 473 ft MSL**

Depth in Feet	Driven Sample	N value	Material Description	USCS	Color	Moisture	Consistency	Dry Density (pcf)
			Undocumented Fill (Qaf): 1" gravel layer overlying Silty Sand, fine to medium grained.	SM	Light Brown	Damp to Moist	Medium Dense	
			Very Old Paralic Deposits ($Qvop_7$): Clayey Sand/ Sandy Clay with gravel, fine to medium grained, some dark, manganese nodules.	SC/CL	Light Brown	Moist	Medium Dense	
5		22	Sandy Clay with gravel	CL			Very Stiff	101.3
10		31 50 6"	Encountered some cobble-sized rock			Very Moist		100.9
15		33	Sandstone, weakly cemented, fine grained	SM			Dense	
			Gravel layer at 18'					
20			**Refusal at 19'** **Groundwater not encountered**					

Moisture Content (% Dry Weight): 10 20 30 40 50

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Exploratory Boring Logs

City of San Diego Mohawk Pump Station

Project No.: V-0322-G | **Figure No.: A-6**

Boring Log No. 7

Date Drilled: 8-15-2014 | **Exploratory Equipment: Diedrich D-50**

Driving Weight: 140 lbs - 30" drop | **Surface Elevation: 474 ft MSL**

Depth in Feet	Driven Sample	N value	Material Description	USCS	Color	Moisture	Consistency	Dry Density (pcf)	Moisture Content (% Dry Weight)
			Undocumented Fill (Qaf): 1" gravel layer overlying Sandy Clay, trace gravel.	CL	Dark Brown	Damp	Medium Stiff		
			Very Old Paralic Deposits ($Qvop_7$): Silty Sand, fine to coarse grained, grace gravel, some iron oxide staining.	SM	Light Brown	Moist	Medium Dense		
5		30 50 5"	Silty Sand with gravel				Very Dense	115.7	
10		27	Clayey Sand/Sandy Clay	SC/CL			Medium Dense		
			Encountered gravel at 14.5'				Very Dense		
15		50 4"							
			Refusal at 16' **Groundwater not encountered**						
20									

Moisture Content (% Dry Weight): 10 20 30 40 50

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Exploratory Boring Logs

City of San Diego Mohawk Pump Station

Project No.: V-0322-G | **Figure No.: A-8**

Boring Log No. 8

Date Drilled: 8-15-2014 | **Exploratory Equipment: Diedrich D-50**

Driving Weight: 140 lbs - 30" drop | **Surface Elevation: 470 ft MSL**

Depth in Feet	Driven Sample	N value	Material Description	USCS	Color	Moisture	Consistency	Dry Density (pcf)
			6 inches asphaltic concrete					
			Undocumented Fill (Qaf): Sandy Clay, fine grained.	CL	Gray-Brown	Moist	Stiff	
			Very Old Paralic Deposits ($Qvop_7$): Sandy Clay, fine to medium grained, some iron oxide staining.	CL	Brown	Moist to Very Moist	Very Stiff	
5		34						119.3
			Clayey Sand, interbedded with Sandy Clay	SC		Damp to Moist	Dense	
10		46	Silty Sand, fine grained, trace gravel, dark manganese staining.	SM	Light Brown			
			Gravel layer					
		30 50 6"					Very Dense	
15			**End of boring at 14'** **Groundwater not encountered**					
20								

Moisture Content (% Dry Weight)

10 20 30 40 50

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Exploratory Boring Logs

City of San Diego Mohawk Pump Station

Project No.: V-0322-G | **Figure No.: A-9**

Boring Log No. 9

Date Drilled: 8-18-2014 | **Exploratory Equipment: Diedrich D-50**

Driving Weight: 140 lbs - 30" drop | **Surface Elevation: 464 ft MSL**

Depth in Feet	Driven Sample	N value	Material Description	USCS	Color	Moisture	Consistency	Dry Density (pcf)
			4.5 inches asphaltic concrete					
			Undocumented Fill (Qaf): Silty Clay, some gravel.	CL	Gray/ Brown	Moist	Stiff	
			Very Old Paralic Deposits ($Qvop_7$): Sandy Clay/Clayey Sand with gravel, some iron oxide staining.	CL/SC	Brown	Damp to Moist	Very Stiff	
5		30	Clayey Sand with gravel.	SC			Dense	128.0
10		41				Very Moist		114.6
		34 50 4"					Very Dense	122.6
15			**End of boring at 14.5'** **Groundwater not encountered**					
20								

Moisture Content (% Dry Weight)

10 20 30 40 50

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Exploratory Boring Logs

City of San Diego Mohawk Pump Station

Project No.: V-0322-G | **Figure No.: A-10**

Boring Log No. 10

Date Drilled: 8-18-2014 | **Exploratory Equipment: Diedrich D-50**

Driving Weight: 140 lbs - 30" drop | **Surface Elevation: 465 ft MSL**

Depth in Feet	Driven Sample	N value	Material Description	USCS	Color	Moisture	Consistency	Dry Density (pcf)	Moisture Content (% Dry Weight)
			5 inches asphaltic concrete						
			Undocumented Fill (Qaf): Clayey Sand with gravel.	SC	Brown	Moist	Medium Dense		
			Very Old Paralic Deposits ($Qvop_7$): Sandy Clay/Clayey Sand with gravel.	CL/SC	Brown	Damp to Moist	Very Stiff		
5		30	Sandy Clay	CL	Gray/ Brown			114.5	
10		45	Sandstone, fine to medium grained, contains some gravel, some iron oxide staining.	SP	Tan		Dense to Very Dense		
		21 50 6"						108.3	
15			**End of boring at 14.5'** **Groundwater not encountered**						
20									

Moisture Content (% Dry Weight): 10 20 30 40 50

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Exploratory Boring Logs

City of San Diego Mohawk Pump Station

Project No.: V-0322-G | **Figure No.: A-11**

Appendix B

Laboratory Test Results

Prepared by VO Engineering

Laboratory Test Results

In-Situ Moisture Content and Dry Density

The in-situ moisture content of the soils was determined in accordance with ASTM D-2216 laboratory test method. This method involves obtaining the moist weight of the sample and then drying the sample to obtain its dry weight. The moisture content is calculated by taking the difference between the wet and dry weights, dividing it by the dry weight of the sample and expressing the result as a percentage. The results of the in-situ moisture content and dry density tests are presented below:

(ASTM D-2216, D-2937)

Location	Moisture Content (%)	Dry Density (pcf)
B-1 @ 1-3'	6.7	-
B-3 @ 5'	11.1	-
B-3 @ 10'	8.8	-
B-4 @ 5'	10.6	125.0
B-5 @ 5'	7.3	120.2
B-5 @ 10'	8.0	119.4
B-6 @ 5'	13.5	101.3
B-6 @ 10'	15.2	100.9
B-6 @ 15'	16.8	-
B-7 @ 5'	10.2	115.7
B-7 @ 10'	8.8	-
B-8 @ 5'	11.1	119.3
B-8 @ 10'	12.6	-
B-9 @ 5'	6.4	123.0
B-9 @ 10'	17.2	114.6
B-9 @ 13'	9.9	122.6
B-10 @ 5'	6.9	114.5
B-10 @ 10'	6.1	-
B-10 @ 13'	7.0	108.3

Particle Size Analyses

In accordance with ASTM D-422, quantitative determinations of the distribution of coarse-grained particle sizes in selected samples were made. Mechanically actuated sieves were utilized for separating the various classes of coarse-grained (gravel and sand) particles. For soil samples containing fine-grained particle sizes, additional testing was conducted in accordance with ASTM D-1140 to determine the fines content (i.e., soil passing a No. 200 Sieve). The sieve analysis test results are provided in the table below:

Sieve Analysis Test Results (ASTM D-422)

Sieve Size	B-1 @ 1-3' Percent Passing	B-3 @ 1-3' Percent Passing	B-4 @ 1-4' Percent Passing	B-5 @ 1-4' Percent Passing	B-6 @ 1-4' Percent Passing
¾ in.	100	100	100	100	100
½ in.	97	95	100	99	100
3/8 in.	94	93	100	99	100
¼ in.	91	91	100	99	99
#4	90	90	99	98	99
#8	87	88	99	97	98
#10	86	87	99	97	96
#16	84	84	99	94	89
#30	77	68	94	85	72
#40	72	54	84	74	59
#50	67	42	67	64	45
#100	48	31	42	51	26
#200	40	27	35	46	20
Classification	(SC)	(SC)	(SC)	(SC)	(SC)

Sieve Size	B-7 @ 1-4' Percent Passing	B-8 @ 1-4' Percent Passing	B-9 @ 1-4' Percent Passing	B-10 @ 1-4' Percent Passing
¾ in.	100	100	100	100
½ in.	100	100	100	99
3/8 in.	100	100	100	98
¼ in.	99	99	98	97
#4	95	97	98	96
#8	91	96	95	95
#10	89	94	93	94
#16	84	90	86	91
#30	72	76	72	81
#40	63	69	64	74
#50	53	60	56	66
#100	35	46	44	53
#200	24	39	37	46
Classification	(SC)	(SC)	(SC)	(SC)

Expansion Index

Testing was performed on a representative on-site sample in accordance with ASTM D4829, and the expansion potential of these samples was evaluated in accordance with the table provided in the test method. Test results are provided in the table below:

Location	Expansion Index	Expansion Potential
B-6 @ 1-4'	2	Very Low
B-7 @ 1-4'	3	Very Low

Direct Shear

Direct shear tests were performed on relatively undisturbed samples in accordance with ASTM D-3080 to evaluate the shear strength characteristics of the on-site materials. The test method consists of placing the soil sample in the direct shear device, applying a series of normal stresses, and then shearing the sample at a constant rate of shearing deformation. The shearing force and horizontal displacements are measured and recorded as the soil specimen is sheared. The shearing is continued well beyond the point of maximum stress until the stress reaches a constant or residual value. Test results are presented in the table below:

Direct Shear Test Results (ASTM D-3080)

Location	Apparent Cohesion (psf)	ϕ (degrees)
B-6 @ 5'	450	27
B-7 @ 5'	550	25

R Value

Resistance "R" value testing was performed on a bulk soil sample in accordance with ASTM D-2844 for the development of pavement design. Test results are provided in the table below:

R Value Test Results (ASTM D-2844)

Location	R Value
B-7 @ 1-4'	16

Corrosion Tests

Chemical analytical tests were performed on bulk soil samples collected during the field exploration program to evaluate the corrosion potential of the on-site materials. The tests were performed by Clarkson Laboratory and Supply, Inc. These tests were performed in accordance with California Test Method Nos. 417 (sulfate), 422 (chloride), and 643 (pH and resistivity). The results of the tests are summarized below:

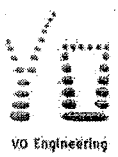
Corrosion Test Results (CTM Nos. 417, 422, & 643)

Boring No.	Depth (feet)	pH	Resistivity (ohm-cm)	Chloride Content (ppm)	Sulfate Content (ppm)
B-1	4-6	6.8	670	40	130
B-6	5-6	6.4	720	30	20
B-7	5-6	6.0	1300	20	40
B-9	8-10	8.9	690	20	20
B-10	8-10	9.1	920	30	40

Appendix C

Information About Your Geotechnical Engineering Report

Prepared by ASFE



Important Information About Your

Geotechnical Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

The following information is provided to help you manage your risks.

Geotechnical Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical engineering study conducted for a civil engineer may not fulfill the needs of a construction contractor or even another civil engineer. Because each geotechnical engineering study is unique, each geotechnical engineering report is unique, prepared *solely* for the client. No one except you should rely on your geotechnical engineering report without first conferring with the geotechnical engineer who prepared it. *And no one — not even you* — should apply the report for any purpose or project except the one originally contemplated.

Read the Full Report

Serious problems have occurred because those relying on a geotechnical engineering report did not read it all. Do not rely on an executive summary. Do not read selected elements only.

A Geotechnical Engineering Report Is Based on A Unique Set of Project-Specific Factors

Geotechnical engineers consider a number of unique, project-specific factors when establishing the scope of a study. Typical factors include: the client's goals, objectives, and risk management preferences; the general nature of the structure involved, its size, and configuration; the location of the structure on the site; and other planned or existing site improvements, such as access roads, parking lots, and underground utilities. Unless the geotechnical engineer who conducted the study specifically indicates otherwise, do not rely on a geotechnical engineering report that was:

- not prepared for you,
- not prepared for your project,
- not prepared for the specific site explored, or
- completed before important project changes were made.

Typical changes that can erode the reliability of an existing geotechnical engineering report include those that affect:

- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light industrial plant to a refrigerated warehouse,
- elevation, configuration, location, orientation, or weight of the proposed structure,
- composition of the design team, or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes—even minor ones—and request an assessment of their impact. *Geotechnical engineers cannot accept responsibility or liability for problems that occur because their reports do not consider developments of which they were not informed.*

Subsurface Conditions Can Change

A geotechnical engineering report is based on conditions that existed at the time the study was performed. *Do not rely on a geotechnical engineering report* whose adequacy may have been affected by: the passage of time; by man-made events, such as construction on or adjacent to the site; or by natural events, such as floods, earthquakes, or groundwater fluctuations. *Always* contact the geotechnical engineer before applying the report to determine if it is still reliable. A minor amount of additional testing or analysis could prevent major problems.

Most Geotechnical Findings Are Professional Opinions

Site exploration identifies subsurface conditions only at those points where subsurface tests are conducted or samples are taken. Geotechnical engineers review field and laboratory data and then apply their professional judgment to render an opinion about subsurface conditions throughout the site. Actual subsurface conditions may differ—sometimes significantly—from those indicated in your report. Retaining the geotechnical engineer who developed your report to provide construction observation is the most effective method of managing the risks associated with unanticipated conditions.

A Report's Recommendations Are *Not* Final

Do not overrely on the construction recommendations included in your report. *Those recommendations are not final,* because geotechnical engineers develop them principally from judgment and opinion. Geotechnical engineers can finalize their recommendations only by observing actual

subsurface conditions revealed during construction. *The geotechnical engineer who developed your report cannot assume responsibility or liability for the report's recommendations if that engineer does not perform construction observation.*

A Geotechnical Engineering Report Is Subject to Misinterpretation

Other design team members' misinterpretation of geotechnical engineering reports has resulted in costly problems. Lower that risk by having your geotechnical engineer confer with appropriate members of the design team after submitting the report. Also retain your geotechnical engineer to review pertinent elements of the design team's plans and specifications. Contractors can also misinterpret a geotechnical engineering report. Reduce that risk by having your geotechnical engineer participate in prebid and preconstruction conferences, and by providing construction observation.

Do Not Redraw the Engineer's Logs

Geotechnical engineers prepare final boring and testing logs based upon their interpretation of field logs and laboratory data. To prevent errors or omissions, the logs included in a geotechnical engineering report should *never* be redrawn for inclusion in architectural or other design drawings. Only photographic or electronic reproduction is acceptable, *but recognize that separating logs from the report can elevate risk.*

Give Contractors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can make contractors liable for unanticipated subsurface conditions by limiting what they provide for bid preparation. To help prevent costly problems, give contractors the complete geotechnical engineering report, *but* preface it with a clearly written letter of transmittal. In that letter, advise contractors that the report was not prepared for purposes of bid development and that the report's accuracy is limited; encourage them to confer with the geotechnical engineer who prepared the report (a modest fee may be required) and/or to conduct additional study to obtain the specific types of information they need or prefer. A prebid conference can also be valuable. *Be sure contractors have sufficient time* to perform additional study. Only then might you be in a position to give contractors the best information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions.

Read Responsibility Provisions Closely

Some clients, design professionals, and contractors do not recognize that geotechnical engineering is far less exact than other engineering disciplines. This lack of understanding has created unrealistic expectations that have led to disappointments, claims, and disputes. To help reduce the risk of such outcomes, geotechnical engineers commonly include a variety of explanatory provisions in their reports. Sometimes labeled "limitations" many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered

The equipment, techniques, and personnel used to perform a *geoenvironmental* study differ significantly from those used to perform a *geotechnical* study. For that reason, a geotechnical engineering report does not usually relate any geoenvironmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated environmental problems have led to numerous project failures.* If you have not yet obtained your own geoenvironmental information, ask your geotechnical consultant for risk management guidance. *Do not rely on an environmental report prepared for someone else.*

Obtain Professional Assistance To Deal with Mold

Diverse strategies can be applied during building design, construction, operation, and maintenance to prevent significant amounts of mold from growing on indoor surfaces. To be effective, all such strategies should be devised for the *express purpose* of mold prevention, integrated into a comprehensive plan, and executed with diligent oversight by a professional mold prevention consultant. Because just a small amount of water or moisture can lead to the development of severe mold infestations, a number of mold prevention strategies focus on keeping building surfaces dry. While groundwater, water infiltration, and similar issues may have been addressed as part of the geotechnical engineering study whose findings are conveyed in this report, the geotechnical engineer in charge of this project is not a mold prevention consultant; ***none of the services performed in connection with the geotechnical engineer's study were designed or conducted for the purpose of mold prevention. Proper implementation of the recommendations conveyed in this report will not of itself be sufficient to prevent mold from growing in or on the structure involved.***

Rely on Your ASFE-Member Geotechnical Engineer for Additional Assistance

Membership in ASFE/The Best People on Earth exposes geotechnical engineers to a wide array of risk management techniques that can be of genuine benefit for everyone involved with a construction project. Confer with you ASFE-member geotechnical engineer for more information.

ASFE
The Best People on Earth

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APPENDIX M

ADVANCED METERING INFRASTRUCTURE (AMI) DEVICE PROTECTION

Protecting AMI Devices in Meter Boxes and on Street Lights

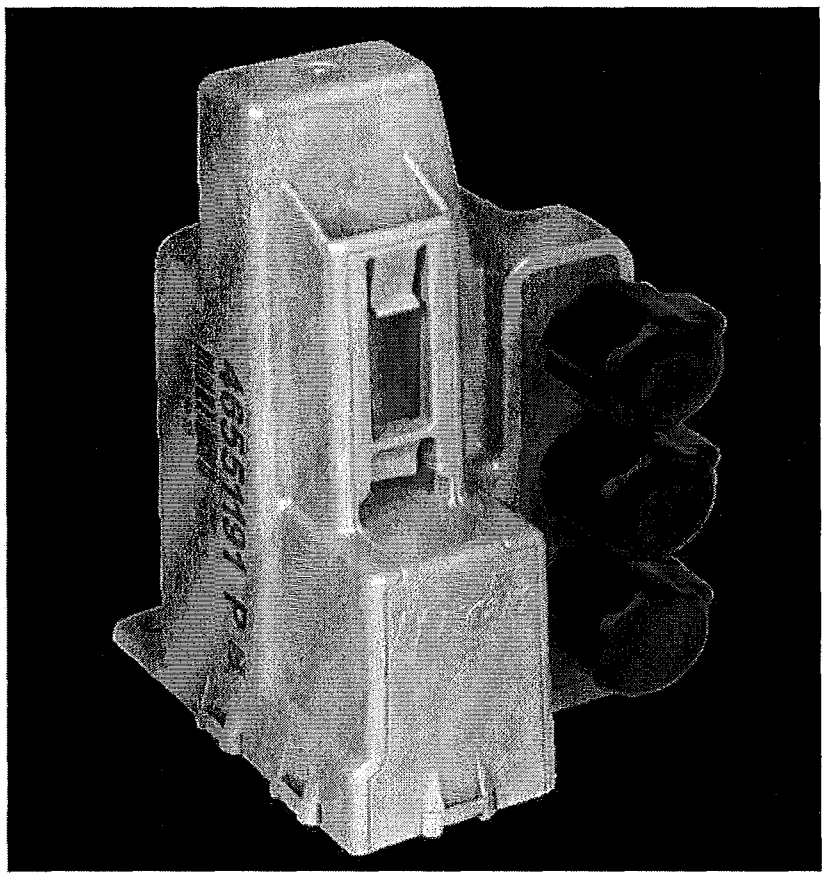
The Public Utilities Department (PUD) has begun the installation of the Advanced Metering Infrastructure (AMI) technology as a new tool to enhance water meter reading accuracy and efficiency, customer service and billing, and to be used by individual accounts to better manage the efficient use of water. **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:

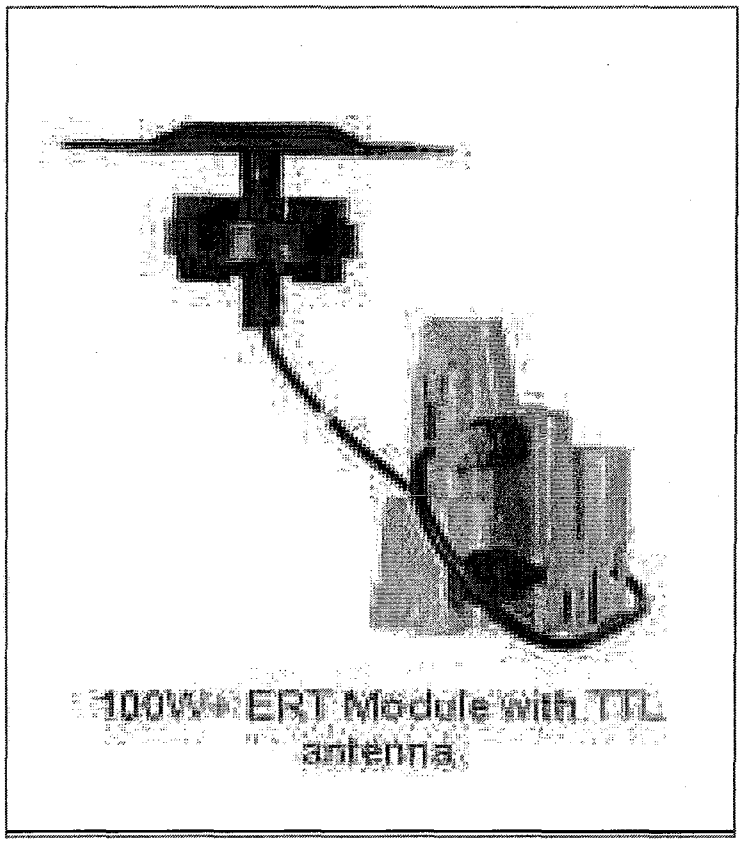
A. Endpoints, see Photo 1:

Photo 1



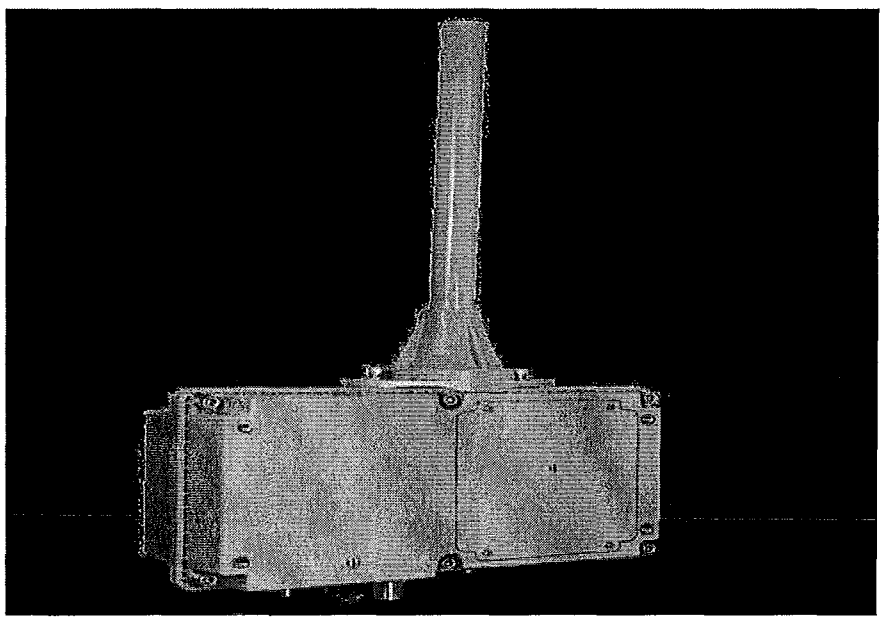
B. AMI Antenna attached to Endpoint (antenna not always required), see Photo 2:

Photo 2



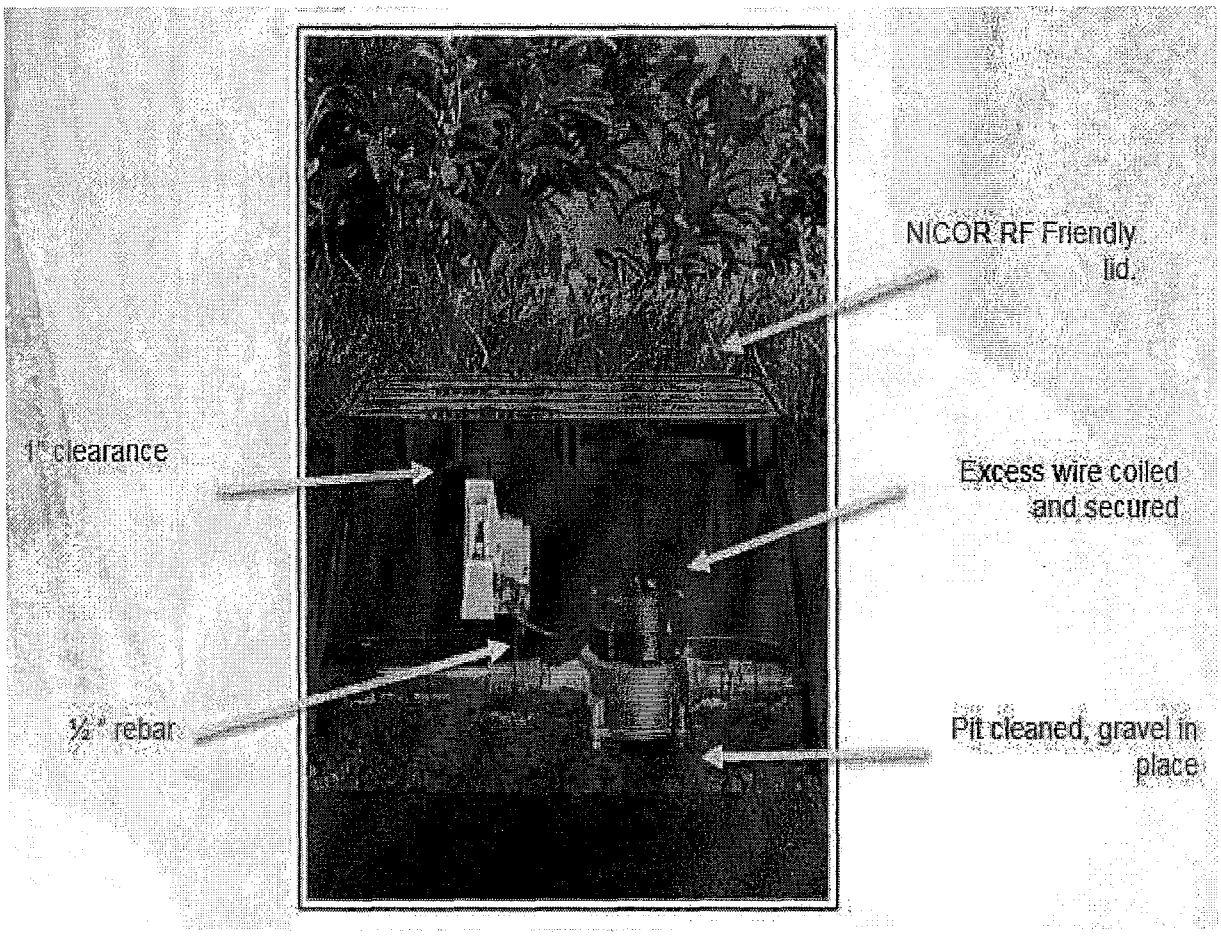
Network Devices, see Photo 3:

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

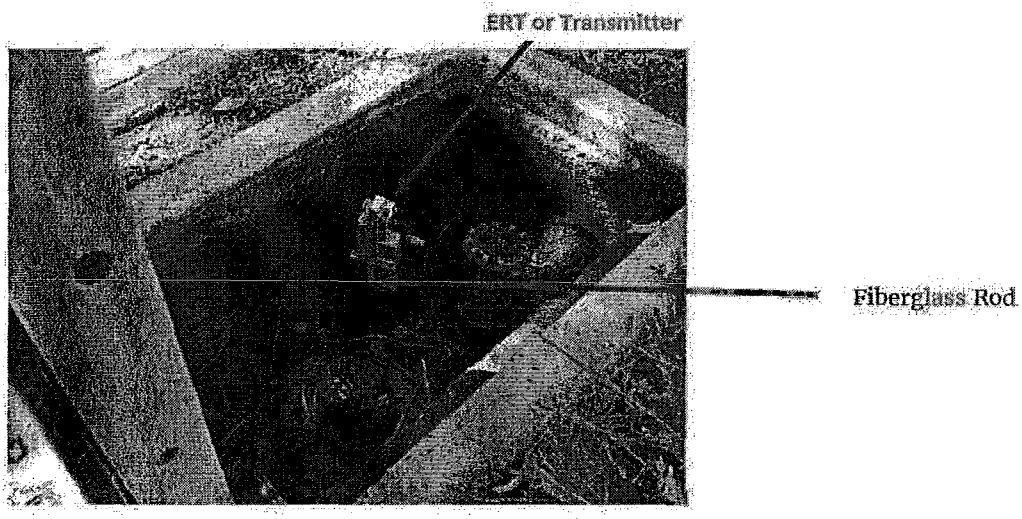
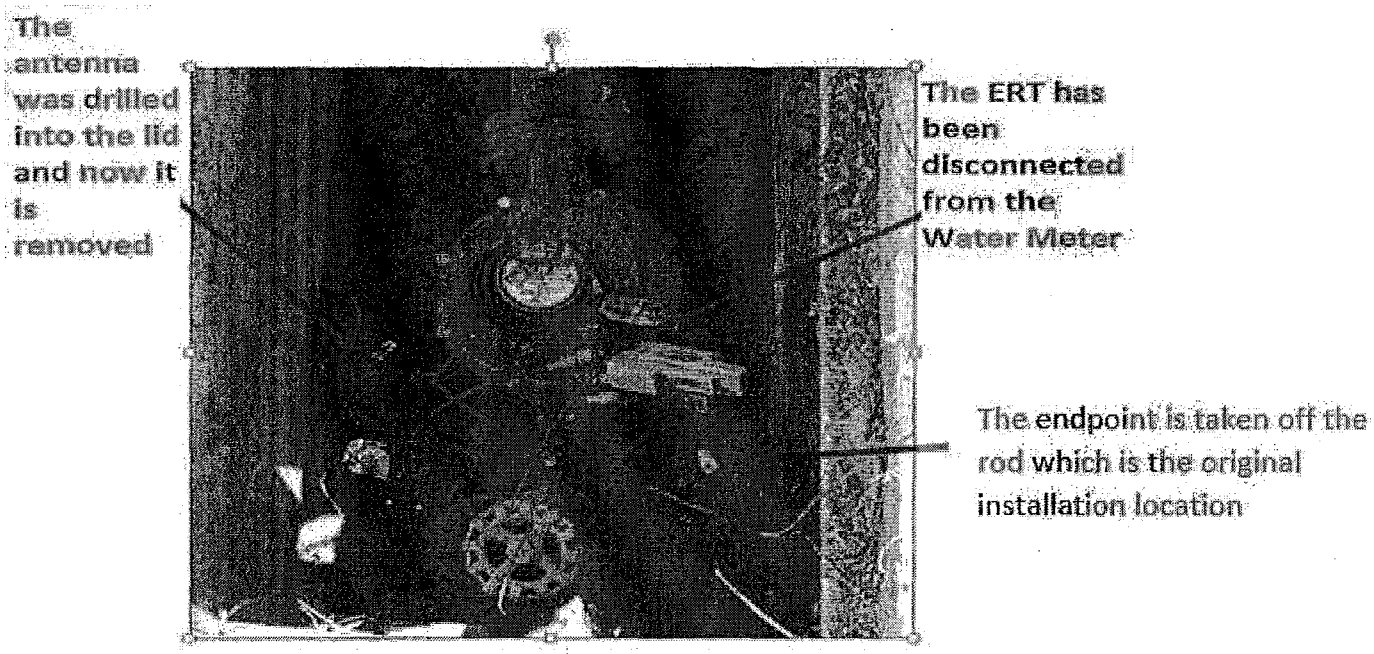


Photo 6 below is an example of disturbance that shall be avoided:

Photo 6



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

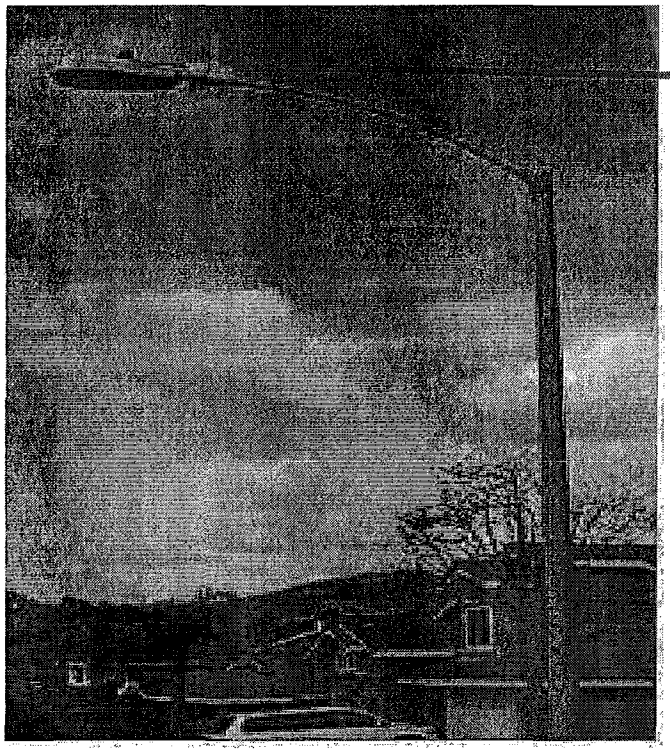
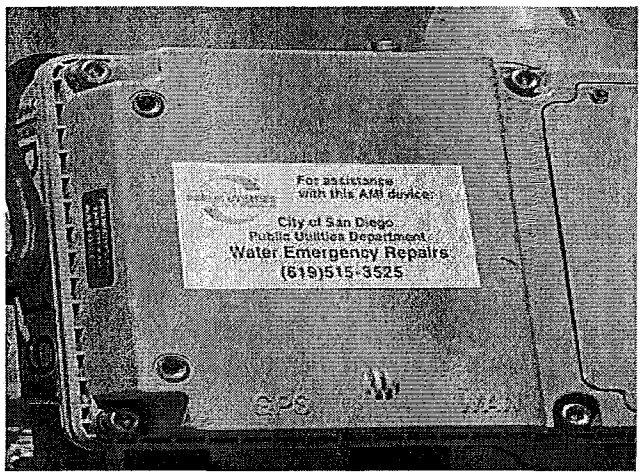


Photo 9



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.

ATTACHMENT F

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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 West Coast General Corporation/PK Mechanical Systems, Inc. A Joint Venture, herein called "Contractor" for construction of **69th & Mohawk Pump Station** Bid No. **K-17-1401-DBB-3** in the amount of Ten Million Ninety Nine Thousand One Hundred Fourteen Dollars and 65/100 ($10,099,114.65), which is comprised of the Base Bid plus Additive Alternate A and Additive Alternate D.

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) Phased Funding Schedule Agreement.
   (e) That certain documents entitled **69th & Mohawk Pump Station** on file in the office of the Public Works Department as Document No. **S-12011**, 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 **69th & Mohawk Pump Station**, Bid Number **K-17-1401-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.
6. The City shall guarantee the Contractor a minimum value of total work (Minimum Contract Amount) of $10,000 up to a potential maximum value of total work (Maximum Contract Amount) of $5,000,000. The period during which new Task Orders may be issued pursuant to this contract is 24 months or the expenditure of the $5,000,000, whichever comes first. The total Contract term, including the completion of all tasks, may not exceed 5 years.

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

By _____

Print Name: James Nagelvoort
Director
Department of Public Works

Date: 5/25/17

APPROVED AS TO FORM

Mara W. Elliott, City Attorney

By _____

Print Name: _____
Deputy City Attorney

Date: 5/30/17

CONTRACTOR West Coast General Corporation/PK Mechanical System, Inc., A Joint Venture

By _____

Print Name: David E. Davey

Title: Managing Partner

Date: 4/3/17

City of San Diego License No.: WCG - B1992002309 / PKM - B2013064036

State Contractor's License No.: 986656

DEPARTMENT OF INDUSTRIAL RELATIONS (DIR) REGISTRATION NUMBER: 1000045191

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:

_____

(Name of Project or Task)

as particularly described in said contract and identified as Bid No. _____ ; SAP No. (WBS/IO/CC) _____; 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 _____, _____.

_____ Contractor

by

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

SUBCONTRACTORS ADDITIVE/DEDUCTIVE ALTERNATE

***** FOR USE WHEN LISTING SUBCONTRACTORS ON ALTERNATES *****
TO BE SUBMITTED WITH OTHER REQUIRED FORMS
(Use Additional Sheets As Needed)

ALTERNATE A

SUBCONTRACTOR NAME, LOCATION, PHONE & EMAIL	CONSTRUCTOR OR DESIGNER	SUBCONTRACTOR LICENSE NUMBER	TYPE OF WORK	DOLLAR VALUE OF SUBCONTRACT	MBE, WBE, DBE, DVBE, OBE, ELBE, SLBE, SDB, WoSB, HUBZone, OR SDVOSB①	WHERE CERTIFIED	CHECK IF JOINT VENTURE PARTNERSHIP
Name:_____ Address:_____ City:_____ State:_____ Zip:_____ Phone:_____ Email:_____	None						
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.

SUBCONTRACTORS ADDITIVE/DEDUCTIVE ALTERNATE

***** FOR USE WHEN LISTING SUBCONTRACTORS ON ALTERNATES *****
TO BE SUBMITTED WITH OTHER REQUIRED FORMS
(Use Additional Sheets As Needed)

ALTERNATE B

SUBCONTRACTOR NAME, LOCATION, PHONE & EMAIL	CONSTRUCTOR OR DESIGNER	SUBCONTRACTOR LICENSE NUMBER	TYPE OF WORK	DOLLAR VALUE OF SUBCONTRACT	MBE, WBE, DBE, DVBE, OBE, ELBE, SLBE, SDB, WoSB, HUBZone, OR SDVOSB①	WHERE CERTIFIED	CHECK IF JOINT VENTURE PARTNERSHIP
Name:_____ Address:_____ City:_____ State:_____ Zip:_____ Phone:_____ Email:_____	None						
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.

SUBCONTRACTORS ADDITIVE/DEDUCTIVE ALTERNATE

***** FOR USE WHEN LISTING SUBCONTRACTORS ON ALTERNATES *****
TO BE SUBMITTED WITH OTHER REQUIRED FORMS
(Use Additional Sheets As Needed)

ALTERNATE C

SUBCONTRACTOR NAME, LOCATION, PHONE & EMAIL	CONSTRUCTOR OR DESIGNER	SUBCONTRACTOR LICENSE NUMBER	TYPE OF WORK	DOLLAR VALUE OF SUBCONTRACT	MBE, WBE, DBE, DVBE, OBE, ELBE, SLBE, SDB, WoSB, HUBZone, OR SDVOSB①	WHERE CERTIFIED	CHECK IF JOINT VENTURE PARTNERSHIP
Name:_____ Address:_____ City:_____ State:_____ Zip:_____ Phone:_____ Email:_____	None						
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.

SUBCONTRACTORS ADDITIVE/DEDUCTIVE ALTERNATE

***** FOR USE WHEN LISTING SUBCONTRACTORS ON ALTERNATES *****
TO BE SUBMITTED WITH OTHER REQUIRED FORMS
(Use Additional Sheets As Needed)

ALTERNATE D

SUBCONTRACTOR NAME, LOCATION, PHONE & EMAIL	CONSTRUCTOR OR DESIGNER	SUBCONTRACTOR LICENSE NUMBER	TYPE OF WORK	DOLLAR VALUE OF SUBCONTRACT	MBE, WBE, DBE, DVBE, OBE, ELBE, SLBE, SDB, WoSB, HUBZone, OR SDVOSB①	WHERE CERTIFIED	CHECK IF JOINT VENTURE PARTNERSHIP
Name:_____ Address:_____ City:_____ State:_____ Zip:_____ Phone:_____ Email:_____	None						
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.

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**
C. **EQUAL BENEFITS ORDINANCE - CERTIFICATION OF COMPLIANCE**
D. **LOBBY PROHIBITION, CERTIFICATION AND DISCLOSURE**

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 West Coast General Corporation/PK Mechanical Systems, Inc. a Joint Venture as Principal, and Fidelity and Deposit Company of Maryland 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

69th & Mohawk Pump Station

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 22 day of February, 20 17

West Coast General Corporation/
PK Mechanical Systems, Inc. a Joint Venture (SEAL)

(Principal)

By: _____ David E. Davey, Managing Partner

(Signature)

Fidelity and Deposit
Company of Maryland (SEAL)

(Surety)

By: _____ Aidan Smock, Attorney-in-Fact

(Signature)

(SEAL AND NOTARIAL ACKNOWLEDGEMENT OF SURETY)

ZURICH AMERICAN INSURANCE COMPANY
COLONIAL AMERICAN CASUALTY AND SURETY COMPANY
FIDELITY AND DEPOSIT COMPANY OF MARYLAND
POWER OF ATTORNEY

KNOW ALL MEN BY THESE PRESENTS: That the ZURICH AMERICAN INSURANCE COMPANY, a corporation of the State of New York, the COLONIAL AMERICAN CASUALTY AND SURETY COMPANY, a corporation of the State of Maryland, and the FIDELITY AND DEPOSIT COMPANY OF MARYLAND a corporation of the State of Maryland (herein collectively called the "Companies"), by **GERALD F. HALEY, Vice President,** in pursuance of authority granted by Article V, Section 8, of the By-Laws of said Companies, which are set forth on the reverse side hereof and are hereby certified to be in full force and effect on the date hereof, do hereby nominate, constitute, and appoint **Richard HALLETT, Aidan SMOCK, Tim MCCLELLAN and Marta COLLETT, all of San Diego, California, EACH** its true and lawful agent and Attorney-in-Fact, to make, execute, seal and deliver, for, and on its behalf as surety, and as its act and deed: **any and all bonds and undertakings,** and the execution of such bonds or undertakings in pursuance of these presents, shall be as binding upon said Companies, as fully and amply, to all intents and purposes, as if they had been duly executed and acknowledged by the regularly elected officers of the ZURICH AMERICAN INSURANCE COMPANY at its office in New York, New York., the regularly elected officers of the COLONIAL AMERICAN CASUALTY AND SURETY COMPANY at its office in Owings Mills, Maryland., and the regularly elected officers of the FIDELITY AND DEPOSIT COMPANY OF MARYLAND at its office in Owings Mills, Maryland., in their own proper persons.

The said Vice President does hereby certify that the extract set forth on the reverse side hereof is a true copy of Article V, Section 8, of the By-Laws of said Companies, and is now in force.

IN WITNESS WHEREOF, the said Vice-President has hereunto subscribed his/her names and affixed the Corporate Seals of the said **ZURICH AMERICAN INSURANCE COMPANY, COLONIAL AMERICAN CASUALTY AND SURETY COMPANY, and FIDELITY AND DEPOSIT COMPANY OF MARYLAND,** this 14th day of September, A.D. 2016.

ATTEST:

ZURICH AMERICAN INSURANCE COMPANY
COLONIAL AMERICAN CASUALTY AND SURETY COMPANY
FIDELITY AND DEPOSIT COMPANY OF MARYLAND

By: _____ _____

Secretary
Eric D. Barnes

Vice President
Gerald F. Haley

State of Maryland
County of Baltimore

On this 14th day of September, A.D. 2016, before the subscriber, a Notary Public of the State of Maryland, duly commissioned and qualified, **GERALD F. HALEY, Vice President, and ERIC D. BARNES, Secretary,** of the Companies, to me personally known to be the individuals and officers described in and who executed the preceding instrument, and acknowledged the execution of same, and being by me duly sworn, deposeth and saith, that he/she is the said officer of the Company aforesaid, and that the seals affixed to the preceding instrument are the Corporate Seals of said Companies, and that the said Corporate Seals and the signature as such officer were duly affixed and subscribed to the said instrument by the authority and direction of the said Corporations.

IN TESTIMONY WHEREOF, I have hereunto set my hand and affixed my Official Seal the day and year first above written.

_____

Constance A. Dunn, Notary Public
My Commission Expires: July 9, 2019

EXTRACT FROM BY-LAWS OF THE COMPANIES

"Article V, Section 8, Attorneys-in-Fact. The Chief Executive Officer, the President, or any Executive Vice President or Vice President may, by written instrument under the attested corporate seal, appoint attorneys-in-fact with authority to execute bonds, policies, recognizances, stipulations, undertakings, or other like instruments on behalf of the Company, and may authorize any officer or any such attorney-in-fact to affix the corporate seal thereto; and may with or without cause modify of revoke any such appointment or authority at any time."

CERTIFICATE

I, the undersigned, Vice President of the ZURICH AMERICAN INSURANCE COMPANY, the COLONIAL AMERICAN CASUALTY AND SURETY COMPANY, and the FIDELITY AND DEPOSIT COMPANY OF MARYLAND, do hereby certify that the foregoing Power of Attorney is still in full force and effect on the date of this certificate; and I do further certify that Article V, Section 8, of the By-Laws of the Companies is still in force.

This Power of Attorney and Certificate may be signed by facsimile under and by authority of the following resolution of the Board of Directors of the ZURICH AMERICAN INSURANCE COMPANY at a meeting duly called and held on the 15th day of December 1998.

RESOLVED: "That the signature of the President or a Vice President and the attesting signature of a Secretary or an Assistant Secretary and the Seal of the Company may be affixed by facsimile on any Power of Attorney...Any such Power or any certificate thereof bearing such facsimile signature and seal shall be valid and binding on the Company."

This Power of Attorney and Certificate may be signed by facsimile under and by authority of the following resolution of the Board of Directors of the COLONIAL AMERICAN CASUALTY AND SURETY COMPANY at a meeting duly called and held on the 5th day of May, 1994, and the following resolution of the Board of Directors of the FIDELITY AND DEPOSIT COMPANY OF MARYLAND at a meeting duly called and held on the 10th day of May, 1990.

RESOLVED: "That the facsimile or mechanically reproduced seal of the company and facsimile or mechanically reproduced signature of any Vice-President, Secretary, or Assistant Secretary of the Company, whether made heretofore or hereafter, wherever appearing upon a certified copy of any power of attorney issued by the Company, shall be valid and binding upon the Company with the same force and effect as though manually affixed.

IN TESTIMONY WHEREOF, I have hereunto subscribed my name and affixed the corporate seals of the said Companies, this ____ day of FEB 22 2017 20____.

Michael Bond, Vice President

CALIFORNIA ALL-PURPOSE ACKNOWLEDGMENT

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 FEB 22 2017 (Date) before me, Richard P. Hallett (Insert Name of Notary exactly as it appears on the official seal), Notary Public,

personally appeared Aidan Smock (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 of Notary Public)

RICHARD P. HALLETT
Commission No. 2114065
NOTARY PUBLIC - CALIFORNIA
SAN DIEGO COUNTY
Commission Expires July 2, 2019

Place Notary Seal Above

OPTIONAL

Though the information below is not required by law, it may prove valuable to persons relying on the document and could prevent fraudulent removal and reattachment of the form to another 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: _____
- ☐ Individual
- ☐ Corporate Officer — Title(s): _____
- ☐ Partner ☐ Limited ☐ General
- ☐ Attorney in Fact
- ☐ Trustee
- ☐ Guardian or Conservator
- ☐ Other: _____

Signer is Representing:

RIGHT THUMBPRINT OF SIGNER
Top of thumb here

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

Signer is Representing:

RIGHT THUMBPRINT OF SIGNER
Top of thumb here

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
	N/A - None				

Contractor Name: West Coast General Corporation/PK Mechanical Systems, Inc., a Joint Venture

Certified By David E. Davey Title Managing Partner

Name

Date 2/22/17

Signature

USE ADDITIONAL FORMS AS NECESSARY

EQUAL BENEFITS ORDINANCE

CERTIFICATION OF COMPLIANCE

For additional information, contact:
CITY OF SAN DIEGO
EQUAL BENEFITS PROGRAM
202 C Street, MS 9A, San Diego, CA 92101

COMPANY INFORMATION	
Company Name: West Coast General Corporation/ PK Mechanical Systems, Inc., a Joint Venture	Contact Name: David E. Davey
Company Address: 13700 Stowe Drive, Suite 100	Contact Phone: 619.561.4200 ext. 114
Poway, CA 92064	Contact Email: ddavey@wcgcorp.com

CONTRACT INFORMATION	
Contract Title: 69th & Mohawk Pump Station	Start Date: 352 days after NTP
Contract Number (if no number, state location): K-17-1401-DBB-3	End Date: 352 days after NTP

SUMMARY OF EQUAL BENEFITS ORDINANCE REQUIREMENTS

The Equal Benefits Ordinance [EBO] requires the City to enter into contracts only with contractors who certify they will provide and maintain equal benefits as defined in SDMC §22.4302 for the duration of the contract. To comply:

- Contractor shall offer equal benefits to employees with spouses and employees with domestic partners.
  - Benefits include health, dental, vision insurance; pension/401(k) plans; bereavement, family, parental leave; discounts, child care; travel/relocation expenses; employee assistance programs; credit union membership; or any other benefit.
  - Any benefit not offer an employee with a spouse, is not required to be offered to an employee with a domestic partner.
- Contractor shall post notice of firm's equal benefits policy in the workplace and notify employees at time of hire and during open enrollment periods.
- Contractor shall allow City access to records, when requested, to confirm compliance with EBO requirements.
- Contractor shall submit *EBO Certification of Compliance*, signed under penalty of perjury, prior to award of contract.

NOTE: This summary is provided for convenience. Full text of the EBO and Rules Implementing the EBO are available at *www.sandiego.gov/administration.*

CONTRACTOR EQUAL BENEFITS ORDINANCE CERTIFICATION

Please indicate your firm's compliance status with the EBO. The City may request supporting documentation.

☒ I affirm **compliance** with the EBO because my firm *(contractor must select one reason)*:

- ☒ Provides equal benefits to spouses and domestic partners.
- ☐ Provides no benefits to spouses or domestic partners.
- ☐ Has no employees.
- ☐ Has collective bargaining agreement(s) in place prior to January 1, 2011, that has not been renewed or expired.

☐ I request the City's approval to pay affected employees a cash equivalent in lieu of equal benefits and verify my firm made a reasonable effort but is not able to provide equal benefits upon contract award. I agree to notify employees of the availability of a cash equivalent for benefits available to spouses but not domestic partners and to continue to make every reasonable effort to extend all available benefits to domestic partners.

It is unlawful for any contractor to knowingly submit any false information to the City regarding equal benefits or cash equivalent associated with the execution, award, amendment, or administration of any contract. [San Diego Municipal Code §22.4307(a)] Under penalty of perjury under laws of the State of California, I certify the above information is true and correct. I further certify that my firm understands the requirements of the Equal Benefits Ordinance and will provide and maintain equal benefits for the duration of the contract or pay a cash equivalent if authorized by the City.

David E. Davey, Managing Partner		2/22/17
Name/Title of Signatory	Signature	Date

FOR OFFICIAL CITY USE ONLY

Receipt Date: EBO Analyst: ☐ Approved ☐ Not Approved – Reason:

(Rev 02/15/2011

LOBBY PROHIBITION, CERTIFICATION AND DISCLOSURE

In acknowledgment that funds received under this agreement have been provided pursuant to a Federal grant, recipient hereby recognizes the prohibitions against lobbying the Federal government with any of these funds. Recipient agrees that it shall comply with the laws set forth at 31 U.S.C. § 1352 (1989) and 24 C.F.R. part 87, to wit:

A. Conditions on use of funds

Recipient shall not expend any funds received pursuant to this agreement to pay any person to influence an officer or employee of Federal agency, a member of Congress, an officer or employee of Congress, or an employee of a member of Congress in connection with any of the following Covered Federal actions:

(1) The awarding of any federal contract
(2) The making of any Federal grant
(3) The making of any Federal Loan
(4) The entering into of any cooperative agreement
(5) The extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

For purposes of defining the terms of this part of the agreement, the definitions set forth in 24 C.F.R. § 87.105 are hereby adopted and incorporated herein by reference.

B. Certification and Disclosure

Each recipient at every tier under this agreement shall file a certification regarding lobbying, and a Disclosure Form-LLL, where required by 24 C.F.R. § 87.110. The certification form and Disclosure Form-LLL are attached to this agreement.

C. Certifications must be filed:

(1) By any person upon each submission that initiates agency consideration for an award of a Federal contract, grant, or cooperative agreement exceeding $100,000, or a Federal loan or loan guarantee exceeding $150,000.
(2) Upon receipt by any person of a Federal contract, grant, or cooperative agreement exceeding $100,000, or upon receipt of a Federal loan or loan guarantee exceeding $150,000.
(3) By any person who requests or receives from a person referred to in subsections 1 and 2 of this paragraph:
   a. A subcontract exceeding $100,000 at any tier under a Federal contract;
   b. A subgrant, contract or subcontract exceeding $100,000 at any tier under a Federal grant;
   c. A contract or subcontract exceeding $100,000 at any tier under a Federal loan exceeding $150,000;
   d. A contract or subcontract exceeding $100,000 at any tier under a Federal cooperative agreement.

D. Disclosure Forms-LLL must be filed in every instance when a person applies for, requests, or receives Federal appropriations exceeding $100,000 pursuant to a contract, subcontract, grant, subgrant, loan, or cooperative agreement when such person has paid or expects to pay any sum, in cash or in kind, to influence or attempt to influence any officer or employee of an agency, a member of Congress, an officer or employee of Congress, or an employee of a member of Congress. Further, Disclosure Form-LLL must be filed by recipients at any tier at the end of each calendar quarter in which there occurs any event that requires disclosure or materially affects information submitted in prior disclosures. Such events include:

(1) 1. An increase of $25,000 in the amount paid or expected to be paid for influencing or attempting to influence a covered Federal action;
(2) 2. A change in the person(s) influencing or attempting to influence a covered action;
(3) 3. A change in the officer(s), employee(s), or member(s) contacted to influence a covered action.

All disclosure Forms-LLL, but not certifications, shall be forwarded from tier to tier until received by the principal recipient, which in turn will file them with the appropriate Federal agency.

INSTRUCTIONS FOR COMPLETION OF SF-LLL, DISCLOSURE OF LOBBYING ACTIVITIES

This disclosure form shall be completed by the reporting entity, whether subawardee or prime Federal recipient, at the initiation or receipt of a covered Federal action, or a material change to a previous filing, pursuant to title 31 U.S.C. section 1352. The filing of a form is required for each payment or agreement to make payment to any lobbying entity for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with a covered Federal action. Use the SF-LLLA Continuation Sheet for additional information if the space on the form is inadequate. Complete all items that apply for both the initial filing and material change report. Refer to the implementing guidance published by the Office of Management and Budget for additional information.

1. Identify the type of covered Federal action for which lobbying activity is and/or has been secured to influence the outcome of a covered Federal action.
2. Identify the status of the covered Federal action.
3. Identify the appropriate classification of this report. If this is a follow up report caused by a material change to the information previously reported, enter the year and quarter in which the change occurred. Enter the date of the last previously submitted report by this reporting entity for this covered Federal action.
4. Enter the full name, address, city, State and zip code of the reporting entity. Include Congressional District, if known. Check the appropriate classification of the reporting entity that designates if it is, or expects to be, a prime or subaward recipient. Identify the tier of the subawardee, e.g., the first subawardee of the prime is the 1st tier. Subawards include but are not limited to subcontracts, subgrants and contract awards under grants.
5. If the organization filing there port in item 4 checks "Subawardee," then enter the full name, address, city, State and zip code of the prime Federal recipient. Include Congressional District, if known.
6. Enter the name of the Federal agency making the award or loan commitment. Include at least one organizational level below agency name, if known. For example, Department of Transportation, United States Coast Guard.
7. Enter the Federal program name or description for the covered Federal action (item1). If known, enter the full Catalog of Federal Domestic Assistance (CFDA) number for grants, cooperative agreements, loans, and loan commitments.
8. Enter the most appropriate Federal identifying number available for the Federal action identified in item 1 (e.g., Request for Proposal (RFP) number; Invitation for Bid (IFB) number; grant announcement number; the contract, grant, or loan award number; the application/proposal control number assigned by the Federal agency). Include prefixes, e.g., "RFP-DE-90-001."
9. For a covered Federal action where there has been an award or loan commitment by the Federal agency, enter the Federal amount of the award/loan commitment for the prime entity identified in item 4 or 5.
10. (a) Enter the full name, address, city, State and zip code of the lobbying entity engaged by the reporting entity identified in item 4 to influence the covered Federal action.

    (b) Enter the full names of the individual(s) performing services, and include full address if different from 10 (a). Enter Last Name, First Name, and Middle Initial (MI).
11. Enter the amount of compensation paid or reasonably expected to be paid by the reporting entity (item4) to the lobbying entity (item10). Indicate whether the payment has been made (actual) or will be made (planned). Check all boxes that apply. If this is a material change report, enter the cumulative amount of payment made or planned to be made.
12. Check the appropriate box(es). Check all boxes that apply. If payment is made through an in-kind contribution, specify the nature and value of the in-kind payment.
13. Check the appropriate box(es). Check all boxes that apply. If other, specify nature.
14. Provide a specific and detailed description of the services that the lobbyist has performed, or will be expected to perform, and the date(s) of any services rendered. Include all preparatory and related activity, not just time spent in actual contact with Federal officials. Identify the Federal official(s) or employee(s) contacted or the officer(s), employee(s), or Member(s) of Congress that were contacted.
15. Check whether or not a SF-LLLA Continuation Sheet(s) is attached.
16. The certifying official shall sign and date the form, print his/her name, title, and telephone number.

*****No Lobbying Activities *****

DISCLOSURE OF LOBBYING ACTIVITIES Approved by OMB

Complete this form to disclose lobbying activities pursuant to 31 U.S.C. 13520348-0046

(See reverse for public burden disclosure)

1. Type of Federal Action:	2. Status of Federal Action:	3. Report Type:
☐ a. Contract a. Grant b. Cooperative agreement c. Loan d. Loan guarantee e. Loan insurance	☐ a. bid/offer/application b. initial award c. post-award	☐ a. initial finding b. material change **For Material Change Only** year_____ quarter _____ date of last report_____

4. Name and Address of Reporting Entity: ☐ Prime ☐ Subawardee Tier _____, *if known:* Congressional District, *if known:*	5. If Reporting Entity in No. 4 is a Subawardee, Enter Name and Address of Prime: Congressional District, *if known:*
6. Federal Department/Agency:	7. Federal Program Name/Description: CFDA Number, *if applicable:* _____
8. Federal Action Number, if known:	9. Award Amount, if known: $
10. a. Name and Address of Lobbying Entity (if individual, last name, first name, M)	b. Individuals Performing Services (including address if different from No. 10a) (last name, first name, MI):
(attach Continuation Sheet(s) SF-LLL4, *if necessary*)	
11. Amount of Payment (check all that apply) $_____ ☐ actual ☐ planned	13. Type of Payment (check all that apply) ☐ a. retainer ☐ b. one-time lee ☐ c. commission ☐ d. contingent fee ☐ e. deferral ☐ f. other: specify:_____
12. Form of Payment (check all that apply) ☐ a, cash ☐ b. in-kind: specify: nature _____ Value_____	

14. Brief Description of Services Performed or to be Performed and Date(s) of Service, Including officer(s), employee(s), or Member(s), contacted, for Payment indicated in item 11:

(attach Continuation Sheet(s) SF-LLLA, *if necessary*)

15. Continuation Sheet(s) SF-LLLA attached: ☐ Yes ☐ No

16.	Information requested through this for misauthorized by title 31 U.S.C. section 1352. This disclosure of lobbying activities is a material representation of fact upon which reliance was placed by the tier above when this transaction was made or entered into. This disclosure is required pursuant to 31 U.S.C. 1352. This information will be reported to the Congress semi-annually and will be available for public inspection. Any person who fails to file the required disclosure may be subject to a civil penalty of not less that $10,000 and not more than $100,000 for each such failure.	Signature: _____ Print Name: West Coast General Corporation/ PK Mechanical Systems, Inc., a Joint Venture Title: David E. Davey, Managing Partner Telephone No.: 619.561.4200 ext. 114 Date: _____

Federal Use Only: Authorized for Local Reproduction Standard Form LLL (Rev. 7-07)

DISCLOSURE OF LOBBYING ACTIVITIES
CONTINUATION SHEET

Approved by
OMB0348-0046

Reporting Entity: _____ Page _____
of_____

*******No Lobbying Activities *******

Authorized for Local Reproduction
Standard Form - LLL-A

Bid Results for Project 69th & Mohawk Pump Station (K-17-1401-DBB-3)
Issued on 09/29/2016
Bid Due on February 23, 2017 2:00 PM (Pacific)
Exported on 02/24/2017

VendorID	Company Name	Address	City	ZipCode	Contact	Phone	Fax	Email	Vendor Type
420821	West Coast General Corporation/PK Mechanical Systems Inc A Joint Venture	13700 Stowe Dr., Suite #100	Poway	92064	Nicholas Walters	619-561-4200 ext. 118	619-561-4205	nwalters@wcgcorp.com	PQUAL,Local

Respondee	Respondee Title	Respondee Phone	Respondee Email
David Davey	President	619-561-4200	ddavey@wcgcorp.com

Bid Format	Submitted Date	Delivery Method	Responsive	Status	Confirmation #	Ranking
Electronic	February 23, 2017 1:58:54 PM (Pacific)			Submitted	93879	0

Attachments		
File Title	**File Name**	**File Type**
Certification of Pending Actions	Contractors Certification of Pending Actions.pdf	General Attachments
Equal Benefits Ordinance	Equal Benefits Ordinance.pdf	General Attachments
Lobby Prohibition Certification and Disclosure	Lobby Prohibition, Certification and Disclosure.pdf	General Attachments
Sub Add / Deductive	Subcontractors Additive Deductive.pdf	General Attachments
DBE	DBE.pdf	General Attachments
Bid Bond	Bid Bond.pdf	Bid Bond

Line Items

Item Num	Section	Item Code	Description	Unit of Measure	Quantity	Reference	Unit Price	Line Total
1	Main Bid	524126	Pump Station Building and associated suction and discharge piping (indicated on drawing C-16) and improvements (including demolition, clearing and grubbing, earthwork, decorative site and retaining walls, steel fencing and gates, drainage, paving, flow meter vault, pumping and HVAC equipment, acoustical treatment and incidental work) within the pump station site property boundary, excluding bid items listed separately	LS	1	01015-1.29	$3,489,150.00	$3,489,150.00
2	Main Bid	524126	Pump Station and Emergency Gen-set Start-up and Testing	LS	1	01650-2.08	$11,000.00	$11,000.00
3	Main Bid	524126	Electrical and Instrumentation	LS	1	01015-1.29	$1,015,298.00	$1,015,298.00
4	Main Bid	524126	Emergency Gen-set Enclosure including generator installation, decorative masonry walls, concrete slab, gates and trellis	LS	1	01015-1.29	$123,474.00	$123,474.00
5	Main Bid	524126	Bonds (Payment and Performance)	LS	1	2-4.1	$62,000.00	$62,000.00
6	Main Bid	236220	Building Permits - Type 1	AL	1	7-5.3	$25,000.00	$25,000.00
7	Main Bid	238990	Video Recording of Existing Conditions	LS	1	7-9.1.1	$4,950.00	$4,950.00
8	Main Bid	541330	Traffic Control Design	LS	1	7-10.2.6	$5,000.00	$5,000.00
9	Main Bid	237310	Traffic Control	LS	1	7-10.2.6	$95,120.00	$95,120.00
10	Main Bid	237310	Flashing Arrow Boards	LS	1	7-10.2.6	$2,500.00	$2,500.00
11	Main Bid	541820	Exclusive Community Liaison Services	LS	1	7-16.4	$10,000.00	$10,000.00
12	Main Bid	237110	Operation & Maintenance Manuals	LS	1	9-3.1	$1,100.00	$1,100.00
13	Main Bid	237310	Special Inspection	LS	1	1400	$72,359.00	$72,359.00
14	Main Bid	237110	Mobilization	LS	1	9-3.4.1	$255,970.00	$255,970.00
15	Main Bid		Field Orders - Type II	AL	1	9-3.5	$300,000.00	$300,000.00
16	Main Bid	237310	Additional Pavement Removal & Disposal	CY	5	300-1.4	$150.00	$750.00
17	Main Bid	237310	Adjusting Existing Gate Valve Cover to Grade	EA	5	301-1.7	$300.00	$1,500.00
18	Main Bid	237310	Adjusting Existing Manhole Frame & Cover to Grade	EA	5	301-1.7	$500.00	$2,500.00
19	Main Bid	237310	Traffic Detector Loop Replacement	EA	30	302-1.12	$550.00	$16,500.00
20	Main Bid	237310	Cold Mill AC Pavement (0 - 1 1/2")	SF	1000	302-1.12	$3.58	$3,580.00
21	Main Bid	237310	Cold Mill Header Cuts	LF	3250	302-1.12	$2.48	$8,060.00
22	Main Bid	237310	Cold Milling Additional PCC	LF	100	302-1.12	$14.00	$1,400.00
23	Main Bid	237310	Removal of Humps & Pavement Irregularities	LF	100	302-1.12	$14.00	$1,400.00
24	Main Bid	237310	Asphalt Pavement Repair	TON	1	302-3.2	$1,500.00	$1,500.00
25	Main Bid	237310	Rubber Polymer Modified Slurry Type III and Striping	SF	188137	302-4.12.4	$0.45	$84,661.65
26	Main Bid	237310	Pavement Restoration Adjacent to Trench	SF	2000	302-5.2.1	$10.00	$20,000.00
27	Main Bid	237310	1-1/2 Inch Asphalt Concrete Overlay and Striping	TON	500	302-5.9	$109.00	$54,500.00
28	Main Bid	237310	Contractor Date Stamp and Impressions	EA	1	303-5.9	$275.00	$275.00
29	Main Bid	237310	Curb & Gutter (6-Inch Curb, Type G)	LF	200	303-5.9	$44.00	$8,800.00
30	Main Bid	237310	Remove and Replace Existing Sidewalk	SF	1000	303-5.9	$11.00	$11,000.00
31	Main Bid	237310	Additional Curb and Gutter Removal and Replacement	LF	20	303-5.9	$60.00	$1,200.00
32	Main Bid	237310	Additional Sidewalk Removal and Replacement	SF	20	303-5.9	$35.00	$700.00
33	Main Bid	237310	PCC Cross Gutter	SF	1303	303-5.9	$22.00	$28,666.00
34	Main Bid	237310	PCC Alley Pavement	SF	1700	303-5.9	$18.00	$30,600.00
35	Main Bid	237310	Curb Ramp Type A with Stainless Steel Detectable Warning Tiles	EA	5	303-5.10.2	$3,850.00	$19,250.00
36	Main Bid	237310	Curb Ramp Type B with Stainless Steel Detectable Warning Tiles	EA	2	303-5.10.2	$3,850.00	$7,700.00
37	Main Bid	237310	Curb Ramp Type C-2 with stainless Steel Detectable Warning Tiles	EA	2	303-5.10.2	$3,850.00	$7,700.00
38	Main Bid	237310	Curb Ramp Type D with Stainless Steel Detectable Warning Tiles	EA	3	303-5.10.2	$3,850.00	$11,550.00
39	Main Bid	237310	Curb Ramp Type Island Passage Way with Stainless Steel Detectable Warning Tiles	EA	1	303-5.10.2	$4,400.00	$4,400.00
40	Main Bid	237310	Miscellanous Ped Ramp Improvements (barricades, striping, street light removal/replacements, tree removal, pedestrian push buttons)	LS	1	303-5.10.2	$25,000.00	$25,000.00
41	Main Bid	237110	Trench Shoring	LS	1	306-1.1.6	$120,000.00	$120,000.00

Bid Results for Project 69th & Mohawk Pump Station (K-17-1401-DBB-3)

Item Num	Section	Item Code	Description	Unit of Measure	Quantity	Reference	Unit Price	Line Total
42	Main Bid	237110	Additional Bedding	CY	50	306-1.2.1.1	$60.00	$3,000.00
43	Main Bid	237310	Temporary Resurfacing	TON	185	306-1.5.1	$115.00	$21,275.00
44	Main Bid	237310	Additional Potholing	EA	30	01015-1.24	$300.00	$9,000.00
45	Main Bid	237110	Imported Backfill	TON	100	02200-1.12	$60.00	$6,000.00
46	Main Bid	237110	8" PVC Pipe, CL 235	LF	915	306-1.6	$90.00	$82,350.00
47	Main Bid	237110	12" PVC Pipe, CL 235	LF	300	306-1.6	$110.00	$33,000.00
48	Main Bid	237110	16" PVC Pipe, CL 235	LF	2585	306-1.6	$150.00	$387,750.00
49	Main Bid	237110	20" PVC Pipe, CL 235	LF	45	306-1.6	$250.00	$11,250.00
50	Main Bid	237110	24" CML& TC Welded Steel Pipe	LF	1075	306-1.6	$400.00	$430,000.00
51	Main Bid	237110	30" CML& TC Welded Steel Pipe	LF	2405	306-1.6	$425.00	$1,022,125.00
52	Main Bid	237110	Thrust Blocks and Anchor Blocks	EA	30	306-1.6	$1,000.00	$30,000.00
53	Main Bid	237110	8-Inch Gate Valve	EA	10	306-1.6	$2,500.00	$25,000.00
54	Main Bid	237110	12-Inch Gate Valve	EA	6	306-1.6	$3,500.00	$21,000.00
55	Main Bid	237110	6-Inch Fire Hydrant Assembly & Marker	EA	15	306-1.6	$9,000.00	$135,000.00
56	Main Bid	237110	8-Inch Fire Service Connection	EA	2	306-1.6	$9,000.00	$18,000.00
57	Main Bid	237110	16-Inch Butterfly Valve Class 150B	EA	14	306-1.6	$7,000.00	$98,000.00
58	Main Bid	237110	20-Inch Butterfly Valve Class 150B	EA	1	306-1.6	$14,000.00	$14,000.00
59	Main Bid	237110	24-Inch Butterfly Valve Class 150B	EA	3	306-1.6	$20,000.00	$60,000.00
60	Main Bid	237110	30-Inch Butterfly Valve Class 150B	EA	11	306-1.6	$23,000.00	$253,000.00
61	Main Bid	237110	4-Inch Water Valve By-pass (20-Inch and larger) Including all valves, piping and appurtenances	EA	13	306-1.6	$6,000.00	$78,000.00
62	Main Bid	237110	Large Water Main Abandonment	LF	3820	306-5.3	$15.00	$57,300.00
63	Main Bid	237110	1-Inch Water Service	EA	60	306-14.1	$2,500.00	$150,000.00
64	Main Bid	237110	2-Inch Water Service	EA	20	306-14.1	$5,000.00	$100,000.00
65	Main Bid	237110	2-Inch Blowoff Valve Assembly	EA	2	306-18	$5,000.00	$10,000.00
66	Main Bid	237110	4-Inch Blowoff Valve Assembly	EA	8	306-18	$8,000.00	$64,000.00
67	Main Bid	237110	1-Inch Air & Vacuum Valve, Class 150	EA	3	306-19	$6,000.00	$18,000.00
68	Main Bid	237110	2-Inch Air & Vacuum Valve, Class 150	EA	5	306-19	$7,000.00	$35,000.00
69	Main Bid	237110	Cathodic Protection	LS	1	13110, 4.10	$100,000.00	$100,000.00
70	Main Bid	238210	SDG&E Fee Allowance - Type I	AL	1	01011-1.06	$15,000.00	$15,000.00
71	Main Bid	238210	Security System Allowance - Type I	AL	1	01011-3.04	$100,000.00	$100,000.00
72	Main Bid	541370	Survey Monuments	LS	1	309-4	$1,100.00	$1,100.00
73	Main Bid	237110	Continental Crosswalk	SF	5000	314-4.4.6	$3.30	$16,500.00
74	Main Bid	541330	Water Pollution Control Program Development	LS	1	701-13.9.5	$605.00	$605.00
75	Main Bid	237990	Water Pollution Control Program Implementation	LS	1	701-13.9.5	$91,677.00	$91,677.00
76	Main Bid	238990	Preparation of Hazardous Waste Management Plan and Reporting - Type I	AL	1	703-20	$5,000.00	$5,000.00
77	Main Bid	238990	Monitoring of Contaminated Soil" (HR).	HR	10	703-20	$325.00	$3,250.00
78	Main Bid	238990	Testing, Sampling, Site Storage, and Handling of Soils Containing RCRA Hazardous Waste (TON)	TON	100	703-20	$50.00	$5,000.00
79	Main Bid	238990	Loading, Transportation and Disposal of soils containing RCRA Hazardous Waste (TON)	TON	100	703-20	$297.00	$29,700.00
80	Main Bid	238990	Testing, Sampling, Site Storage and Handling of Petroleum Contaminated Soil (TON)	TON	100	703-20	$35.00	$3,500.00
81	Main Bid	238990	Loading, Transportation, and Disposal of Petroleum Contaminated Soil (TON)	TON	100	703-20	$99.00	$9,900.00
82	Main Bid	238990	Monitoring, Testing, Sampling Site Storage and Handling of Soils Containing Non-RCRA Hazardous Waste (TON)	TON	100	703-20	$35.00	$3,500.00
83	Main Bid	238990	Loading, Transportation, and Disposal of Soils Containing Non-RCRA Hazardous Waste (TON)	TON	100	703-20	$170.00	$17,000.00
84	Main Bid	238990	Testing, Sampling, Site Storage, Handling, Transportation, and Disposal of Containerized RCRA Hazardous Waste (55 Gal Drums)	55 gallon drum	1	703-20	$500.00	$500.00
85	Main Bid	238990	Testing, Sampling, Site Storage, Handling, Transportation, and Disposal of Containerized Non-RCRA Hazardous Waste (55 Gal Drums)	55 gallon drum	1	703-20	$500.00	$500.00
86	Main Bid	238990	Testing, Sampling, Site Storage, Handling, Transportation and Recycling/Disposal of Universal Waste (EACH)	EA	1	703-20	$170.00	$170.00
87	Main Bid	238990	Testing, Sampling, Site Storage, Handling, Transportation and Recycling/Disposal of Regulated Waste (TON)	TON	100	703-20	$170.00	$17,000.00
88	Main Bid	238990	Testing, Sampling, Site Storage, Handling, Transportation, and Disposal of RCRA Hazardous Waste Contamination from the Treatment of Contaminated Ground Water" (GAL).	GAL	50	703-20	$170.00	$8,500.00
89	Main Bid	238990	Testing, Sampling, Site Storage, Handling, Transportation, and Disposal of Non-RCRA Hazardous Waste Contamination from the Treatment of Contaminated Ground Water" (GAL).	GAL	50	703-20	$170.00	$8,500.00
90	Main Bid	541690	Suspension of Work - Resources	DAYS	5	707-1	$2,200.00	$11,000.00
91	Main Bid	541690	Archeological and Native American Monitoring Program	LF	2800	707-2	$10.00	$28,000.00
92	Main Bid	541690	Archeological and Native American Mitigation and Curation - Type I	AL	1	707-4	$15,000.00	$15,000.00
93	Main Bid	237110	Handling and Disposal of Non-friable Asbestos Material	LF	400	708-6	$15.00	$6,000.00
94	Main Bid	561730	Landscape and Irrigation	LS	1	308-7	$69,080.00	$69,080.00
95	Main Bid	561370	Landscape Maintenance and Monitoring Program	LS	1	308-7	$6,000.00	$6,000.00
96	Main Bid	237110	High-lining by the Contractor	LS	1	600-1.2.2.10	$110,000.00	$110,000.00
97	Main Bid	237110	Pavement Restoration for City Forces Final Connection	SF	5000	600-1.3.1.5	$15.00	$75,000.00
98	Main Bid	238990	Lead Abatement	LS	1	703-20	$16,495.00	$16,495.00
99	Main Bid	238990	Disposal of Lead	LS	1	703-20	$2,547.00	$2,547.00
100	Main Bid	238990	Asbestos Abatement	LS	1	703-20	$21,984.00	$21,984.00
101	Main Bid	238990	Disposal of Asbestos	LS	1	703-20	$2,943.00	$2,943.00
							Subtotal	$9,919,114.65

Bid Results for Project 69th & Mohawk Pump Station (K-17-1401-DBB-3)

Alternate A								
Item Num	Section	Item Code	Description	Unit of Measure	Quantity	Reference	Unit Price	Line Total
102	Alternate A	237110	8-Inch through 12-Inch Connections to The Existing System by Contractor	EA	11	600-1.3.2.10	$7,000.00	$77,000.00
103	Alternate A	237110	16-Inch Connections to The Existing System by Contractor	EA	4	600-1.3.2.10	$7,000.00	$28,000.00
104	Alternate A	237110	20-Inch and Greater Connections to The Existing System by Contractor	EA	2	600-1.3.2.10	$20,000.00	$40,000.00
105	Alternate A	237110	Cut and Plug of The Existing System by Contractor	EA	20	600-1.4.9	$5,000.00	$100,000.00
106	Alternate A	237110	Pavement Restoration for City Forces Final Connection ((Deductive) Enter unit price as negative (-))	SF	-5000	600-1.3.1.5	$15.00	($75,000.00)
							Subtotal	$170,000.00

Alternate B								
Item Num	Section	Item Code	Description	Unit of Measure	Quantity	Reference	Unit Price	Line Total
107	Alternate B	237110	High-lining by the Contractor ((Deductive) Enter unit price as negative (-))	LS	-1	600-1.2.2.10	$110,000.00	($110,000.00)
							Subtotal	($110,000.00)

Alternate C								
Item Num	Section	Item Code	Description	Unit of Measure	Quantity	Reference	Unit Price	Line Total
108	Alternate C	237110	Contractor Furnished Materials for the City Forces High-line Work	LS	1	600-1.2.1.3	$60,000.00	$60,000.00
							Subtotal	$60,000.00

Alternate D								
Item Num	Section	Item Code	Description	Unit of Measure	Quantity	Reference	Unit Price	Line Total
109	Alternate D	237110	High-lining Removed by Contractor	LS	1	600-1.2.1.3	$10,000.00	$10,000.00
							Subtotal	$10,000.00

Total + Alternates	$10,049,114.65

Bid Results for Project 69th & Mohawk Pump Station (K-17-1401-DBB-3)

Subcontractors									
Name	Description	License Num	Amount	Type	DIR #	Address	Address 2	City	ZipCode
Mountain Materials, Inc	Portion of Trucking Services of Export Materials Supplier - MBE	NA	$26,062.00	MBE	NA	PO Box 2154		Lakeside	92040
Magnesite Specialties, Inc.	portion of floor coating CONSTRUCTOR Construction - MBE	397738	$25,000.00	CAU,MALE,CADIR	1000006683	8686 Production Ave., Ste. A		San Diego	92121
Richardson Steel, Inc.	portion of structural steel CONSTRUCTOR Construction - MBE	756989	$151,940.00	CAU,MALE,CADIR	1000000243	9102 Harness Street		Spring Valley	91977
American Asphalt South, Inc.	portion of slurry seal CONSTRUCTOR	784969	$65,737.07	CAU,MALE,PQUAL,CADIR	1000000645	PO Box 310036	14436 Santa Ana Ave	Fontana	92331
Ferreira Construction Co. Inc.	portion of fencing, gates CONSTRUCTOR Construction - MBE	985180	$80,289.00	LAT,MALE,MBE, CADIR,PQUAL	1000001634	15188 Vista Del Rio Avenue		Chino	91710
MCR Technologies	portion of instrument controls supply (2nd tier) SUPPLIER (2nd tier) Supply - MBE	NA	$23,000.00		NA	15615 Alton Parkway Suite 245		Irvine	92618
SCST, Inc.	Portion of Special Inspection CONSULTANT Services - MBE	GE 2752	$52,000.00	CADIR,CAU,DVBE,MALE,S DVSB, SLBE	1000003802	6280 Riverdale Street		San Diego	92120
E.L. Hobbs, Inc.	portion of plaster CONSTRUCTOR Construction - MBE	777073	$43,200.00	CAU,MALE,CADIR	1000004428	1900 Weld Blvd.	Suite 215	El Cajon	92020
Simpson Sandblasting & Special Coatings, Inc.	portion of painting CONSTRUCTOR Construction - MBE	878060	$53,877.00		1000006079	14665 Rancho Vista Dr.		Fontana	92335
Hanson Electric, Inc.	portion of loops, street light, push buttons CONSTRUCTOR Construction - MBE	1006273	$16,300.00	CAU,MALE,SLBE, DVBE,CADIR	1000027946	P.O. Box 1230		Lakeside	92040
National Corrosion	portion of cathodic protection CONSTRUCTOR	1020111	$72,920.00	Asian,MALE	1000045610	5450 Katella Ave Suite 102		Los Alamitos	90720
CE Pickup Company	portion of acoustical panels CONSTRUCTOR	647465	$142,059.00		1000007590	2677 N. Main St		Santa Ana	92705
Select Masonry Contractor	portion of masonry CONSTRUCTOR Construction - MBE	777293	$177,183.00		1000042912	7864 Rhein Court		Rancho Cucamonga	91739
Castlerock Environmental	portion of lead and asbestos abatement CONSTRUCTOR	776105	$39,970.00		1000003462	10040 Painter Ave		Santa Fe Springs	90670
Coast Landscaping Inc.	portion of landscaping CONSTRUCTOR Construction - MBE	353359	$60,800.00	CAU,MALE,SLBE	1000004310	2230 La Mirada Dr Ste B		Vista	92081
SealRight Paving, Inc.	portion of asphalt, cold mill, and overlay CONSTRUCTOR Construction - MBE	364113	$205,718.00	NAT,MALE,PQUAL,MBE,C ADIR	1000003903	9053 Olive Dr.		Spring Valley	91977
Sylvester Roofing Co., Inc.	portion of roofing CONSTRUCTOR Construction - MBE	516696	$44,111.00	PQUAL	1000006357	306-N W. El Norte Pkwy., Suite 371		Escondido	92026
HUDSON SAFE-T-LITE RENTALS	Supply of Traffic Control Devices (portion) SUPPLIER Supplier - WBE (under Robcar Corp)	788289	$4,210.00		1000004051	777 GABLE WAY		EL CAJON	92020
Payco Specialties Inc.	portion of striping CONSTRUCTOR Construction - WBE	298637	$23,098.00	CAU,FEM,PQUAL, SLBE,MBE,SDB, WBE,WOSB	1000003515	120 North Second Ave		Chula Vista	91910
GT Door, Inc.	portion of doors CONSTRUCTOR Construction - MBE	889122	$59,943.00		1000000648	10728 Prospect Ave	Suite E	Santee	92071
Loveless & Linton Consulting-Archaeological	portion of archeo and native american monitoring CONSULTANT Services - WBE	NA	$18,950.00	CAU,FEM,SLBE, DBE,CADIR,SDB, WOSB	10000011264	1421 W. Lewis St		San Diego	92103
EnviroApplications, Inc	portion of monitoring contaminated, hazardous waste handling, disposal, testing CONSTRUCTOR	900796	$107,785.00	SLBE,CADIR	1000038634	2831 Camino Del Rio South, Suite 214		San Diego	92108
Paradigm Mechanical Corporation	portion of HVAC CONSTRUCTOR Construction - WBE	947497	$41,455.00		1000006589	6550 Federal Blvd		Lemon Grove	91945
R. Dugan Construction	portion of structural concrete and site concrete CONSTRUCTOR Construction - WBE/MBE	621586	$228,245.60		621586	6157 Mariatt St.		Mira Loma	91752
US Controls, Inc.	portion of building electrical, and fire alarm controls, comm CONSTRUCTOR Construction - MBE	1020389	$1,034,588.00	CAU,MALE,CADIR	1000044338	2324 S. Vineyard Ave	Suite K	Ontario	91761
Trademark Hoist & Crane	portion of hoist CONSTRUCTOR construction - MBE	761611	$51,740.00	DBE	1000030984	1369 Ridgeway Street		Pomona	91768

Self-Performance
72.69%

City of San Diego

CITY CONTACT: Michelle Muñoz, **Contract Specialist, Email:** MichelleM@sandiego.gov
Phone No. (619) 533-3482, **Fax No.** (619) 533-3633

ADDENDUM "A"

e - Bidding **FOR**

69TH & Mohawk Pump Station

BID NO.:	K-17-1401-DBB-3
SAP NO. (WBS/IO/CC):	S-12011
CLIENT DEPARTMENT:	2000
COUNCIL DISTRICT:	9
PROJECT TYPE:	BJ

BID DUE DATE:

2:00 PM
DECEMBER 1, 2016
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:

1) Registered Engineer — 10/20/16 Date — Seal:

2) For City Engineer — 10/24/16 Date — Seal:

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.

THE SUBMITTAL DATE FOR THIS PROJECT HAS BEEN **EXTENDED AS STATED ON THE COVER PAGE.**

B. BIDDER's QUESTIONS

Q1. In the past, pump station projects for the City required that the contractor procure a material testing and inspection consultant. However, for this project it seems that the City is going to be responsible for it (§01011 part 1.11.B and §02200 part 2.02.B). I would like to know two things: First, will the City cover all soils (e.g. earthwork and soils compaction) and materials inspection/testing (e.g. concrete, masonry, welding. etc.)? Second, how will the City procure these services? In other words, will the City solicit for them separately, use an on-call, or self-perform?

A1. Contractor is responsible to hire/provide and pay for Building permit required material testing and special inspections; City will have staff cover non-Building permit materials testing.

Q2. Page 81 & 82 CASRF Form 334 states the form is to be submitted with GFE but it's a report for payments, payments will not have been made at the time of GFE submission.

Do you require it to be turned in anyways?

A2. Forms UR-334 and Form 5700-52 A MBE/WBE Utilization Form will be deleted from Attachment D, Section 14, Subsection 14.1.1, Items 1 and 2.

Yes. The forms are required to be submitted, See "Item C. Attachments, number 1 for requirements of this Addendum A.

Q3. Page 74, section 7, section C #2 states the contractor has 30 days to post solicitations; page 76, section 12.3 states the contractor has 15 working days to notify and send solicitations 10 days prior to bid opening. Please clarify days prior to bid opening for solicitations and posting deadlines & requirements.

A3. The minimum number of days to post solicitations for bids or proposals will be changed from 30 days to 15 working days on page 74, Item 7, Subitem c2. The Contractor is to provide documentation that the local SBA/MBA offices or websites were notified of the contracting bid opportunity at least 15 working days prior to the Bid opening. Solicitations to potential DBE subcontractors must be sent at least 10 Working Days prior to Bid Opening. Refer to Section 12.3 of Attachment D.

Q4. Page 77, section 12.8 states Federal Agencies must be contacted and solicitations posted on websites; Please clarify if invitation should be mailed. MBDA does not accept postings any longer, are you aware of this?

A4. The Contractor is to post to the U.S. Small Business Administration and Minority Business Development Agency websites as instructed in Attachment D, Section 12.8.

To post a subcontracting opportunity on the U.S. Small Business Administration's website, use the following link to SUB-Net:

https://eweb1.sba.gov/subnet/common/dsp_login.cfm

To post a subcontracting opportunity on the Minority Business Development Agency website, use the following link:

http://www.mbda.gov/workspace

The City has contacted MBDA and they confirmed that their Business Tools are undergoing maintenance with no knowledge of when the site will be up and running again. Since the website is down for maintenance with no completion date, it shall be the Contractor's responsibility to document their efforts to post on the MBDA website and to include the documentation in their GFE.

Q5. Page 78 section 12.9 says "State Agencies (must be contacted) What does contacted mean? Please clarify if invitation should be mailed.

A5. Contacting State agencies is dependent on the requirements indicated in Notes section of Attachment D, following Section 12.9. It is the Contractor's responsibility to contact and utilize the appropriate agencies identified to solicit MBE and WBE's for this project and provide appropriate documentation within their GFE submittal.

Q6. Page 77 12.7 An unanswered phone call is not adequate "Good Faith" What if there is no answering machine or no reply via email etc?

A6. The Contractor is to document all attempts to reach a potential subcontractor within their GFE documentation. Email delivery confirmation is an acceptable form of documentation indicating attempts to contact a potential subcontractor.

Q7. If the subcontractors certification is listed as DBE, is that sufficient or has to be MBE/WBE?

A7. MBEs and WBEs are a part of the larger universe of DBEs. Fair share objectives for this contract are indicated in the Notice Inviting Bids, Section 7.6 with specific goals targeted towards MBE and WBE participation.

Q8. Please clarify the percentages required for the MBE & WBE. Page 6 shows percentages and so does page 32, which one do we follow?

A8. The Environmental Protection Agency (EPA) has subcontracting fair share objectives that are outlined beginning on page 5 of Section 7, Subcontracting Participation Percentages and detailed in Item 7.6 on page 6.

The minority and female participation goals listed in Section 1 of the Funding Agency Provisions refer to the contractor's aggregate work force in each trade on all construction work in the covered area.

Q9. Some subcontractors are listed under multiple NAICS codes, is it ok to count them as solicited for each NAICS code?

A9. Invitations/Solicitations are specific to the work being made available by the Contractor and not the number of NAICS codes connected to a responding company.

Q10. Page 75 section 11.2.2 Bidder shall submit Disadvantaged Business Enterprise Information Form, is this form included in the bid documents? Please indicate the form #.

A10. Disadvantaged Business Enterprise Information Form is added. Refer to page 37 of this Addendum.

Q11. Attachment D, section 12.2, last sentence notes "Do not write to these sources". These sources have requested written advertisements to assist with outreach to DBE's, please confirm that, if requested during the telephone conversations to provide written documentation to these sources that that bidders may write to these sources contrary to the "do not write to these sources" instructions provided in the bid documents".

A11. Do not write to these sources refers to making contact via standard US mail. Solicitations are to be posted using the SBA and MBDA websites where available.

Q12. Please clarify Fair share percentages required for this contract. 7.6 of the notice inviting bids has a table of MBE and WBE percentages for construction, supplies, services and equipment. Are these percentages all added together or is this a construction project and we are to use the percentages listed for construction?

A12. For this contract, please refer to the construction fair share objectives in the Notice Inviting Bids, Section 7.6, page 6, Item 1.

Q13. The GFE requires the bidders to post on the MDBA web portal. When I go to that web site I get a message that they are performing maintenance on their business tools. Full website functionality will be restored shortly. Screen capture attached. When will the MBDA website be available?

Or do you have a link to an active website?

A13. Please refer to answer A4 of this Addendum.

Q14. Please help clarify the following requirement of the City's SDWRSF Funding Agency Provisions:

> 12.6. The Contractor shall send invitations to at least 3 (or all, if less than 3) DBE vendors for each item of work referred by sources contacted. The invitations shall adequately specify the items for which bids are requested. The record of "good faith" efforts shall indicate a real desire for a positive response, such as a certified mail receipt or a documented telephone conversation.

Does this mean that for every NAICS code advertised as work made available we should directly outreach via invitation to a minimum of 3 DBE vendors that are certified under that NAICS code? And then do this for every type of outreach source listed in the documents, i.e. 3 DBE vendors listed for each NAICS in the CALTRANS database and then three in the CPUC database, and then three in the SBA database, etc.?

If one company is qualified under multiple NAICS code can that single invitation count towards multiple NAICS codes? If one qualified company is included in multiple databases, i.e. CALTRANS and SBA, can they count for both?

A14. The Contractor shall send invitations to at least 3 DBE vendors for each item of work made available from each database for the scope of work that is being made available.

Q15. Please confirm that when searching the Caltrans database the Bidder can limit searches to DBE's that have selected district 11 as a district they perform work.

A15. The Bidder is to solicit to DBEs that are willing and able to perform work in District 11, regardless of their physical location. The Bidder is also responsible for contacting other appropriate sources within the geographic area to identify qualified MBE/WBE for placement on your MBE/WBE business solicitations.

Q16. What/where is the specification for the CML&TW steel pipe?

A16. The tape wrap is covered in Technical Specification Section 09873, supplemented by Whitebook Section 207-10.4.7 Cement Mortar Lining and Polyolefin Tape Coating.

C. ATTACHMENTS

1. To Attachment D, Safe Drinking Water State Revolving Fund (SDWSRF) Funding Agency Provisions, page 36, Section 5, Monthly Employment Utilization Reports, Sub-section 5.1., Item 1, **DELETE** in its entirety.

2. To Attachment D, Safe Drinking Water State Revolving Fund (SDWSRF) Funding Agency Provisions, pages 40 through 65, Section 9, Wage Rates, **DELETE** in their entirety and **SUBSTITUTE** with pages 10 through 36 of this Addendum.

3. Attachment D, Safe Drinking Water State Revolving Fund (SDWSRF) Funding Agency Provisions, page 74, Section 11, Agency Specific Provisions, Sub-section 11.1. All EPS Funded Contracts, Item 7, Good Faith Efforts, Sub-item c) For the EPA defined GFE..., Number 2, **DELETE** in its entirety and **SUBSTITUTE** with the following:

    2. Make information on forthcoming opportunities available to DBEs and arrange time frames for contracts and establish delivery schedules, where the requirements permit, in a way that encourages and facilitates participation by DBEs in the competitive process. This includes, whenever possible, posting solicitations for bids or proposals for a minimum of 15 Working days before the bid or proposal closing date.

4. To Attachment D, Safe Drinking Water State Revolving Fund (SDWSRF) Funding Agency Provisions, page 76, Section 11, Agency Specific Provisions, Sub-section 11.2., Annual DBE Utilization Reporting, Item 11.2.2., **DELETE** "Number 9", in its entirety.

5. To Attachment D, Safe Drinking Water State Revolving Fund (SDWSRF) Funding Agency Provisions, page 79, Section 14, Forms, **DELETE** in its entirety and **SUBSTITUTE** with the following:

14. FORMS:

14.1. The Contractor shall demonstrate that efforts were made to attract DBEs on this contract. The Contractor and Subcontractors shall take the steps listed in these specifications to assure that DBEs are used whenever possible as sources of supplies, construction, equipment, or services. In addition to the specified GFE documentation, the Bidder shall submit the following forms:

14.1.1. The following forms shall be submitted **with the Bid submittal** in accordance with Section 11.2 "Safe Drinking Water State Revolving Fund (SDWSRF) Requirements". Failure to include any of the forms shall cause the Bid to be deemed **non-responsive.**

1. SDWSRF DBE Information Form

14.1.2. The following forms shall be completed and submitted **within 4 Working Days of the Bid opening.** Failure to include any of the forms shall cause the Bid to be deemed **non-responsive.**

1. SDWSRF Verification of Qualification
2. Form AA61 List of Work Made Available
3. Form AA62 Summary of Bids Received
4. Form AA63 Good Faith Effort List of Subcontractors Solicited

14.1.3. The following forms shall be submitted **annually** in accordance with Section 11 "AGENCY SPECIFIC PROVISIONS".

1. EPA Form 5700-52A MBE/WBE Utilization Forms
2. California State Revolving Funds (CASRF) Form UR-334

6. To Attachment D, Safe Drinking Water State Revolving Fund (SDWSRF) Funding Agency Provisions, page 80, Funding Agency Provisions Forms, **ADD** "Disadvantage Business Enterprise Form", page 37 of this Addendum.

D. SUPPLEMENTARY SPECIAL PROVISIONS

1. To Attachment E, Section 2, Scope and Control of Work, page 92, Sub-section 2-7, Subsurface Data, Item 4, Sub-item 1, **DELETE** in its entirety and **SUBSTITUTE** with the following:

    1. Geotechnical Study, dated September 2, 2014, by VO Engineering, Inc., See Appendix L.

2. To Attachment E, Section 4, Control of Materials, Sub-section 4-1.1.1., American Iron and Steel (AIS), Item 1., page 93, Sub-item b), **DELETE** in its entirety and **SUBSTITUTE** with the following:

    b) All of the iron and steel products used in the project will be and/or have been produced in the United States in a manner that complies with the American Iron and Steel Requirement with required certification (for sample certification letters, refer to **Appendix "I"**), unless a waiver of the requirement is approved, and;

3. To Attachment E, Section 5, Utilities, Sub-section 5-2, Protection, page 95, Item 2., First Paragraph, **DELETE** in its entirety and **SUBSTITUTE** with the following:

    2. While working in or around meter boxes, you shall protect in place all Advanced Metering Infrastructure (AMI) devices attached to the water meter or located in or near water meter boxes, coffins, or vaults in accordance with **Appendix M**. This includes any antenna installed through the meter box lid.

E. CERTIFICATIONS AND FORMS

1. To Electronically Submitted Forms, page 983, **ADD** the following:

    E. **SDWSRF DBE Information Form**

James Nagelvoort, Director
Public Works Department

Dated: *October 26, 2016*
San Diego, California

JN/AJ/egz

9. WAGE RATES: This contract shall be subject to the following Davis-Bacon Wage Decisions:

General Decision Number: CA160001 10/21/2016 CA1

Superseded General Decision Number: CA20150001

State: California

Construction Types: Building, Heavy (Heavy and Dredging), Highway and Residential

County: San Diego County in California.

BUILDING CONSTRUCTION PROJECTS; DREDGING PROJECTS (does not include hopper dredge work); HEAVY CONSTRUCTION PROJECTS (does not include water well drilling); HIGHWAY CONSTRUCTION PROJECTS; RESIDENTIAL CONSTRUCTION PROJECTS (consisting of single family homes and apartments up to and including 4 stories)

Note: Under Executive Order (EO) 13658, an hourly minimum wage of $10.15 for calendar year 2016 applies to all contracts subject to the Davis-Bacon Act for which the solicitation was issued on or after January 1, 2015. If this contract is covered by the EO, the contractor must pay all workers in any classification listed on this wage determination at least $10.15 (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract in calendar year 2016. The EO minimum wage rate will be adjusted annually. Additional information on contractor requirements and worker protections under the EO is available at www.dol.gov/whd/govcontracts.

Modification Number	Publication Date
0	01/08/2016
1	02/12/2016
2	02/19/2016
3	02/26/2016
4	03/04/2016
5	03/18/2016
6	07/01/2016
7	07/08/2016
8	07/22/2016
9	08/12/2016
10	08/26/2016
11	09/16/2016
12	10/21/2016

* ASBE0005-002 07/04/2016

	Rates	Fringes
Asbestos Workers/Insulator (Includes the application of all insulating materials, protective coverings, coatings, and finishes to all types of mechanical systems)	$ 38.37	20.13
Fire Stop Technician (Application of Firestopping Materials for wall openings and penetrations in walls, floors, ceilings and curtain walls)	$ 26.15	17.31

* ASBE0005-004 07/04/2016

	Rates	Fringes
Asbestos Removal worker/hazardous material handler (Includes preparation, wetting, stripping, removal, scrapping, vacuuming, bagging and disposing of all insulation materials from mechanical systems, whether they contain asbestos or not)	$ 18.38	10.82

BOIL0092-003 10/01/2012

	Rates	Fringes
BOILERMAKER	$ 41.17	28.27

BRCA0004-008 11/01/2015

	Rates	Fringes
BRICKLAYER; MARBLE SETTER	$ 34.44	17.21

* BRCA0018-004 06/01/2016

	Rates	Fringes
MARBLE FINISHER	$ 28.45	11.38
TILE FINISHER	$ 24.53	4.19
TILE LAYER	$ 35.89	8.55

BRCA0018-010 09/01/2013

	Rates	Fringes

TERRAZZO FINISHER	$ 26.59	10.34
TERRAZZO WORKER/SETTER	$ 33.63	11.13

CARP0409-002 07/01/2008

	Rates	Fringes
Diver		
(1) Wet	$ 663.68	9.82
(2) Standby	$ 331.84	9.82
(3) Tender	$ 323.84	9.82
(4) Assistant Tender	$ 299.84	9.82

Amounts in "Rates' column are per day

CARP0409-008 08/01/2010

	Rates	Fringes
Modular Furniture Installer	$ 17.00	7.41

CARP0547-001 07/01/2009

	Rates	Fringes
CARPENTER		
(1) Bridge	$ 37.28	10.58
(2) Commercial Building	$ 32.30	10.58
(3) Heavy & Highway	$ 37.15	10.58
(4) Residential Carpenter	$ 25.84	10.58
(5) Residential Insulation Installer	$ 18.00	8.16
MILLWRIGHT	$ 37.65	10.58
PILEDRIVERMAN	$ 37.28	10.58

CARP0547-002 07/01/2009

	Rates	Fringes
Drywall		
(1) Work on wood framed construction of single family residences, apartments or condominiums under four stories		
Drywall Installer/Lather	$ 21.00	8.58
Drywall Stocker/Scrapper	$ 11.00	6.67
(2) All other work		
Drywall Installer/Lather	$ 27.35	9.58
Drywall Stocker/Scrapper	$ 11.00	6.67

ELEC0569-001 08/31/2015

	Rates	Fringes
Electricians (Tunnel Work)		

Cable Splicer.....$ 46.88 13.54
Electrician.....$ 46.13 13.51

Electricians: (All Other Work, Including 4 Stories Residential)
Cable Splicer.....$ 41.75 13.38
Electrician.....$ 41.00 13.36

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* ELEC0569-004 06/01/2015

	Rates	Fringes
ELECTRICIAN (Sound & Communications Sound Technician)	$ 29.55	11.92

SOUND TECHNICIAN: Terminating, operating and performing final check-out

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ELEC0569-005 06/06/2016

	Rates	Fringes
Sound & Communications		
Sound Technician	$ 30.22	12.21

SOUND TECHNICIAN: Terminating, operating and performing final check-out

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ELEC0569-006 10/05/2015

Work on street lighting; traffic signals; and underground systems and/or established easements outside of buildings

	Rates	Fringes
Traffic signal, street light and underground work		
Utility Technician #1	$ 29.50	8.31
Utility Technician #2	$ 24.65	8.16

STREET LIGHT & TRAFFIC SIGNAL WORK:

UTILITY TECHNICIAN #1: Installation of street lights and traffic signals, including electrical circuitry, programmable controller, pedestal-mounted electrical meter enclosures and laying of pre-assembled cable in ducts. The layout of electrical systems and communication installation including proper position of trench depths, and radius at duct banks, location for manholes, street lights and traffic signals.

UTILITY TECHNICIAN #2: Distribution of material at jobsite, installation of underground ducts for electrical, telephone, cable TV land communication systems. The

setting, leveling, grounding and racking of precast manholes, handholes and transformer pads.

ELEC0569-008 06/06/2016

	Rates	Fringes
ELECTRICIAN (Residential, 1-3 Stories)	$ 31.69	3%+6.61

ELEC1245-001 06/01/2015

	Rates	Fringes
LINE CONSTRUCTION		
(1) Lineman; Cable splicer	$ 52.85	15.53
(2) Equipment specialist (operates crawler tractors, commercial motor vehicles, backhoes, trenchers, cranes (50 tons and below), overhead & underground distribution line equipment)	$ 42.21	14.32
(3) Groundman	$ 32.28	14.03
(4) Powderman	$ 47.19	14.60

HOLIDAYS: New Year's Day, M.L. King Day, Memorial Day, Independence Day, Labor Day, Veterans Day, Thanksgiving Day and day after Thanksgiving, Christmas Day

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ELEV0018-001 01/01/2015

	Rates	Fringes
ELEVATOR MECHANIC	$ 49.90	28.38

FOOTNOTE:
PAID VACATION: Employer contributes 8% of regular hourly rate as vacation pay credit for employees with more than 5 years of service, and 6% for 6 months to 5 years of service.
PAID HOLIDAYS: New Years Day, Memorial Day, Independence Day, Labor Day, Veterans Day, Thanksgiving Day, Friday after Thanksgiving, and Christmas Day.

ENGI0012-003 07/01/2016

	Rates	Fringes
OPERATOR: Power Equipment (All Other Work)		
GROUP 1	$ 39.95	23.35
GROUP 2	$ 40.73	23.35

GROUP 3	$ 41.02	23.35
GROUP 4	$ 42.51	23.35
GROUP 5	$ 41.86	23.35
GROUP 6	$ 41.83	23.35
GROUP 8	$ 42.84	23.35
GROUP 9	$ 42.19	23.35
GROUP 10	$ 42.96	23.35
GROUP 11	$ 42.31	23.35
GROUP 12	$ 43.13	23.35
GROUP 13	$ 43.23	23.35
GROUP 14	$ 43.26	23.35
GROUP 15	$ 43.34	23.35
GROUP 16	$ 43.46	23.35
GROUP 17	$ 43.63	23.35
GROUP 18	$ 43.73	23.35
GROUP 19	$ 43.84	23.35
GROUP 20	$ 43.96	23.35
GROUP 21	$ 44.13	23.35
GROUP 22	$ 44.23	23.35
GROUP 23	$ 44.34	23.35
GROUP 24	$ 44.46	23.35
GROUP 25	$ 44.63	23.35

OPERATOR: Power Equipment
(Cranes, Piledriving &
Hoisting)

GROUP 1	$ 43.20	22.15
GROUP 2	$ 43.98	22.15
GROUP 3	$ 44.27	22.15
GROUP 4	$ 44.41	22.15
GROUP 5	$ 44.63	22.15
GROUP 6	$ 44.74	22.15
GROUP 7	$ 44.86	22.15
GROUP 8	$ 45.03	22.15
GROUP 9	$ 45.20	22.15
GROUP 10	$ 46.20	22.15
GROUP 11	$ 47.20	22.15
GROUP 12	$ 48.20	22.15
GROUP 13	$ 49.20	22.15

OPERATOR: Power Equipment
(Tunnel Work)

GROUP 1	$ 41.80	23.35
GROUP 2	$ 42.58	23.35
GROUP 3	$ 42.87	23.35
GROUP 4	$ 43.01	23.35
GROUP 5	$ 43.23	23.35
GROUP 6	$ 43.34	23.35
GROUP 7	$ 43.46	23.35

PREMIUM PAY:
$3.75 per hour shall be paid on all Power Equipment Operator work on the followng Military Bases: China Lake Naval Reserve, Vandenberg AFB, Point Arguello, Seely Naval Base, Fort Irwin, Nebo Annex Marine Base, Marine Corp Logistics Base Yermo, Edwards AFB, 29 Palms Marine Base and Camp Pendleton

Workers required to suit up and work in a hazardous material environment: $2.00 per hour additional. Combination mixer and compressor operator on gunite work shall be classified as a concrete mobile mixer operator.

SEE ZONE DEFINITIONS AFTER CLASSIFICATIONS

POWER EQUIPMENT OPERATORS CLASSIFICATIONS

GROUP 1: Bargeman; Brakeman; Compressor operator; Ditch Witch, with seat or similar type equipment; Elevator operator-inside; Engineer Oiler; Forklift operator (includes loed, lull or similar types under 5 tons; Generator operator; Generator, pump or compressor plant operator; Pump operator; Signalman; Switchman

GROUP 2: Asphalt-rubber plant operator (nurse tank operator); Concrete mixer operator-skip type; Conveyor operator; Fireman; Forklift operator (includes loed, lull or similar types over 5 tons; Hydrostatic pump operator; oiler crusher (asphalt or concrete plant); Petromat laydown machine; PJU side dum jack; Screening and conveyor machine operator (or similar types); Skiploader (wheel type up to 3/4 yd. without attachment); Tar pot fireman; Temporary heating plant operator; Trenching machine oiler

GROUP 3: Asphalt-rubber blend operator; Bobcat or similar type (Skid steer); Equipment greaser (rack); Ford Ferguson (with dragtype attachments); Helicopter radioman (ground); Stationary pipe wrapping and cleaning machine operator

GROUP 4: Asphalt plant fireman; Backhoe operator (mini-max or similar type); Boring machine operator; Boxman or mixerman (asphalt or concrete); Chip spreading machine operator; Concrete cleaning decontamination machine operator; Concrete Pump Operator (small portable); Drilling machine operator, small auger types (Texoma super economatic or similar types - Hughes 100 or 200 or similar types - drilling depth of 30' maximum); Equipment greaser (grease truck); Guard rail post driver operator; Highline cableway signalman; Hydra-hammer-aero stomper; Micro Tunneling (above ground tunnel); Power concrete curing machine operator; Power concrete saw operator; Power-driven jumbo form setter operator; Power sweeper operator; Rock Wheel Saw/Trencher; Roller operator (compacting); Screed operator (asphalt or concrete); Trenching machine operator (up to 6 ft.); Vacuum or much truck

GROUP 5: Equipment Greaser (Grease Truck/Multi Shift).

GROUP 6: Articulating material hauler; Asphalt plant engineer; Batch plant operator; Bit sharpener; Concrete joint machine operator (canal and similar type); Concrete planer operator; Dandy digger; Deck engine operator; Derrickman (oilfield type); Drilling machine operator, bucket or auger types (Calweld 100 bucket or similar types

- Watson 1000 auger or similar types - Texoma 330, 500 or 600 auger or similar types - drilling depth of 45' maximum); Drilling machine operator; Hydrographic seeder machine operator (straw, pulp or seed), Jackson track maintainer, or similar type; Kalamazoo Switch tamper, or similar type; Machine tool operator; Maginnis internal full slab vibrator, Mechanical berm, curb or gutter(concrete or asphalt); Mechanical finisher operator (concrete, Clary-Johnson-Bidwell or similar); Micro tunnel system (below ground); Pavement breaker operator (truck mounted); Road oil mixing machine operator; Roller operator (asphalt or finish), rubber-tired earth moving equipment (single engine, up to and including 25 yds. struck); Self-propelled tar pipelining machine operator; Skiploader operator (crawler and wheel type, over 3/4 yd. and up to and including 1-1/2 yds.); Slip form pump operator (power driven hydraulic lifting device for concrete forms); Tractor operator-bulldozer, tamper-scraper (single engine, up to 100 h.p. flywheel and similar types, up to and including D-5 and similar types); Tugger hoist operator (1 drum); Ultra high pressure waterjet cutting tool system operator; Vacuum blasting machine operator

GROUP 8: Asphalt or concrete spreading operator (tamping or finishing); Asphalt paving machine operator (Barber Greene or similar type); Asphalt-rubber distribution operator; Backhoe operator (up to and including 3/4 yd.), small ford, Case or similar; Cast-in-place pipe laying machine operator; Combination mixer and compressor operator (gunite work); Compactor operator (self-propelled); Concrete mixer operator (paving); Crushing plant operator; Drill Doctor; Drilling machine operator, Bucket or auger types (Calweld 150 bucket or similar types - Watson 1500, 2000 2500 auger or similar types - Texoma 700, 800 auger or similar types - drilling depth of 60' maximum); Elevating grader operator; Grade checker; Gradall operator; Grouting machine operator; Heavy-duty repairman; Heavy equipment robotics operator; Kalamazoo balliste regulator or similar type; Kolman belt loader and similar type; Le Tourneau blob compactor or similar type; Loader operator (Athey, Euclid, Sierra and similar types); Mobark Chipper or similar; Ozzie padder or similar types; P.C. slot saw; Pneumatic concrete placing machine operator (Hackley-Presswell or similar type); Pumpcrete gun operator; Rock Drill or similar types; Rotary drill operator (excluding caisson type); Rubber-tired earth-moving equipment operator (single engine, caterpillar, Euclid, Athey Wagon and similar types with any and all attachments over 25 yds. up to and including 50 cu. yds. struck); Rubber-tired earth-moving equipment operator (multiple engine up to and including 25 yds. struck); Rubber-tired scraper operator (self-loading paddle wheel type-John Deere, 1040 and similar single unit); Self-propelled curb and gutter machine operator; Shuttle buggy; Skiploader operator (crawler and wheel type over 1-1/2 yds. up to and including 6-1/2 yds.); Soil remediation plant operator; Surface heaters and planer operator; Tractor

compressor drill combination operator; Tractor operator (any type larger than D-5 - 100 flywheel h.p. and over, or similar-bulldozer, tamper, scraper and push tractor single engine); Tractor operator (boom attachments), Traveling pipe wrapping, cleaning and bendng machine operator; Trenching machine operator (over 6 ft. depth capacity, manufacturer's rating); trenching Machine with Road Miner attachment (over 6 ft depth capacity): Ultra high pressure waterjet cutting tool system mechanic; Water pull (compaction) operator

GROUP 9: Heavy Duty Repairman

GROUP 10: Drilling machine operator, Bucket or auger types (Calweld 200 B bucket or similar types-Watson 3000 or 5000 auger or similar types-Texoma 900 auger or similar types-drilling depth of 105' maximum); Dual drum mixer, dynamic compactor LDC350 (or similar types); Monorail locomotive operator (diesel, gas or electric); Motor patrol-blade operator (single engine); Multiple engine tractor operator (Euclid and similar type-except Quad 9 cat.); Rubber-tired earth-moving equipment operator (single engine, over 50 yds. struck); Pneumatic pipe ramming tool and similar types; Prestressed wrapping machine operator; Rubber-tired earth-moving equipment operator (single engine, over 50 yds. struck); Rubber tired earth moving equipment operator (multiple engine, Euclid, caterpillar and similar over 25 yds. and up to 50 yds. struck), Tower crane repairman; Tractor loader operator (crawler and wheel type over 6-1/2 yds.); Woods mixer operator (and similar Pugmill equipment)

GROUP 11: Heavy Duty Repairman - Welder Combination, Welder - Certified.

GROUP 12: Auto grader operator; Automatic slip form operator; Drilling machine operator, bucket or auger types (Calweld, auger 200 CA or similar types - Watson, auger 6000 or similar types - Hughes Super Duty, auger 200 or similar types - drilling depth of 175' maximum); Hoe ram or similar with compressor; Mass excavator operator less tha 750 cu. yards; Mechanical finishing machine operator; Mobile form traveler operator; Motor patrol operator (multi-engine); Pipe mobile machine operator; Rubber-tired earth- moving equipment operator (multiple engine, Euclid, Caterpillar and similar type, over 50 cu. yds. struck); Rubber-tired self- loading scraper operator (paddle-wheel-auger type self-loading - two (2) or more units)

GROUP 13: Rubber-tired earth-moving equipment operator operating equipment with push-pull system (single engine, up to and including 25 yds. struck)

GROUP 14: Canal liner operator; Canal trimmer operator; Remote- control earth-moving equipment operator (operating a second piece of equipment: $1.00 per hour additional);

Wheel excavator operator (over 750 cu. yds.)

GROUP 15: Rubber-tired earth-moving equipment operator, operating equipment with push-pull system (single engine, Caterpillar, Euclid, Athey Wagon and similar types with any and all attachments over 25 yds. and up to and including 50 yds. struck); Rubber-tired earth-moving equipment operator, operating equipment with push-pull system (multiple engine-up to and including 25 yds. struck)

GROUP 16: Rubber-tired earth-moving equipment operator, operating equipment with push-pull system (single engine, over 50 yds. struck); Rubber-tired earth-moving equipment operator, operating equipment with push-pull system (multiple engine, Euclid, Caterpillar and similar, over 25 yds. and up to 50 yds. struck)

GROUP 17: Rubber-tired earth-moving equipment operator, operating equipment with push-pull system (multiple engine, Euclid, Caterpillar and similar, over 50 cu. yds. struck); Tandem tractor operator (operating crawler type tractors in tandem - Quad 9 and similar type)

GROUP 18: Rubber-tired earth-moving equipment operator, operating in tandem (scrapers, belly dumps and similar types in any combination, excluding compaction units - single engine, up to and including 25 yds. struck)

GROUP 19: Rotex concrete belt operator (or similar types); Rubber-tired earth-moving equipment operator, operating in tandem (scrapers, belly dumps and similar types in any combination, excluding compaction units - single engine, Caterpillar, Euclid, Athey Wagon and similar types with any and all attachments over 25 yds.and up to and including 50 cu. yds. struck); Rubber-tired earth-moving equipment operator, operating in tandem (scrapers, belly dumps and similar types in any combination, excluding compaction units - multiple engine, up to and including 25 yds. struck)

GROUP 20: Rubber-tired earth-moving equipment operator, operating in tandem (scrapers, belly dumps and similar types in any combination, excluding compaction units - single engine, over 50 yds. struck); Rubber-tired earth-moving equipment operator, operating in tandem (scrapers, belly dumps, and similar types in any combination, excluding compaction units - multiple engine, Euclid, Caterpillar and similar, over 25 yds. and up to 50 yds. struck)

GROUP 21: Rubber-tired earth-moving equipment operator, operating in tandem (scrapers, belly dumps and similar types in any combination, excluding compaction units - multiple engine, Euclid, Caterpillar and similar type, over 50 cu. yds. struck)

GROUP 22: Rubber-tired earth-moving equipment operator,

operating equipment with the tandem push-pull system (single engine, up to and including 25 yds. struck)

GROUP 23: Rubber-tired earth-moving equipment operator, operating equipment with the tandem push-pull system (single engine, Caterpillar, Euclid, Athey Wagon and similar types with any and all attachments over 25 yds. and up to and including 50 yds. struck); Rubber-tired earth-moving equipment operator, operating with the tandem push-pull system (multiple engine, up to and including 25 yds. struck)

GROUP 24: Rubber-tired earth-moving equipment operator, operating equipment with the tandem push-pull system (single engine, over 50 yds. struck); Rubber-tired earth-moving equipment operator, operating equipment with the tandem push-pull system (multiple engine, Euclid, Caterpillar and similar, over 25 yds. and up to 50 yds. struck)

GROUP 25: Concrete pump operator-truck mounted; Rubber-tired earth-moving equipment operator, operating equipment with the tandem push-pull system (multiple engine, Euclid, Caterpillar and similar type, over 50 cu. yds. struck)

CRANES, PILEDRIVING AND HOISTING EQUIPMENT CLASSIFICATIONS

GROUP 1: Engineer oiler; Fork lift operator (includes loed, lull or similar types)

GROUP 2: Truck crane oiler

GROUP 3: A-frame or winch truck operator; Ross carrier operator (jobsite)

GROUP 4: Bridge-type unloader and turntable operator; Helicopter hoist operator

GROUP 5: Hydraulic boom truck; Stinger crane (Austin-Western or similar type); Tugger hoist operator (1 drum)

GROUP 6: Bridge crane operator; Cretor crane operator; Hoist operator (Chicago boom and similar type); Lift mobile operator; Lift slab machine operator (Vagtborg and similar types); Material hoist and/or manlift operator; Polar gantry crane operator; Self Climbing scaffold (or similar type); Shovel, backhoe, dragline, clamshell operator (over 3/4 yd. and up to 5 cu. yds. mrc); Tugger hoist operator

GROUP 7: Pedestal crane operator; Shovel, backhoe, dragline, clamshell operator (over 5 cu. yds. mrc); Tower crane repair; Tugger hoist operator (3 drum)

GROUP 8: Crane operator (up to and including 25 ton capacity); Crawler transporter operator; Derrick barge operator (up to and including 25 ton capacity); Hoist

operator, stiff legs, Guy derrick or similar type (up to and including 25 ton capacity); Shovel, backhoe, dragline, clamshell operator (over 7 cu. yds., M.R.C.)

GROUP 9: Crane operator (over 25 tons and up to and including 50 tons mrc); Derrick barge operator (over 25 tons up to and including 50 tons mrc); Highline cableway operator; Hoist operator, stiff legs, Guy derrick or similar type (over 25 tons up to and including 50 tons mrc); K-crane operator; Polar crane operator; Self erecting tower crane operator maximum lifting capacity ten tons

GROUP 10: Crane operator (over 50 tons and up to and including 100 tons mrc); Derrick barge operator (over 50 tons up to and including 100 tons mrc); Hoist operator, stiff legs, Guy derrick or similar type (over 50 tons up to and including 100 tons mrc), Mobile tower crane operator (over 50 tons, up to and including 100 tons M.R.C.); Tower crane operator and tower gantry

GROUP 11: Crane operator (over 100 tons and up to and including 200 tons mrc); Derrick barge operator (over 100 tons up to and including 200 tons mrc); Hoist operator, stiff legs, Guy derrick or similar type (over 100 tons up to and including 200 tons mrc); Mobile tower crane operator (over 100 tons up to and including 200 tons mrc)

GROUP 12: Crane operator (over 200 tons up to and including 300 tons mrc); Derrick barge operator (over 200 tons up to and including 300 tons mrc); Hoist operator, stiff legs, Guy derrick or similar type (over 200 tons, up to and including 300 tons mrc); Mobile tower crane operator (over 200 tons, up to and including 300 tons mrc)

GROUP 13: Crane operator (over 300 tons); Derrick barge operator (over 300 tons); Helicopter pilot; Hoist operator, stiff legs, Guy derrick or similar type (over 300 tons); Mobile tower crane operator (over 300 tons)

TUNNEL CLASSIFICATIONS

GROUP 1: Skiploader (wheel type up to 3/4 yd. without attachment)

GROUP 2: Power-driven jumbo form setter operator

GROUP 3: Dinkey locomotive or motorperson (up to and including 10 tons)

GROUP 4: Bit sharpener; Equipment greaser (grease truck); Slip form pump operator (power-driven hydraulic lifting device for concrete forms); Tugger hoist operator (1 drum); Tunnel locomotive operator (over 10 and up to and including 30 tons)

GROUP 5: Backhoe operator (up to and including 3/4 yd.);

Small Ford, Case or similar; Drill doctor; Grouting machine operator; Heading shield operator; Heavy-duty repairperson; Loader operator (Athey, Euclid, Sierra and similar types); Mucking machine operator (1/4 yd., rubber-tired, rail or track type); Pneumatic concrete placing machine operator (Hackley-Presswell or similar type); Pneumatic heading shield (tunnel); Pumpcrete gun operator; Tractor compressor drill combination operator; Tugger hoist operator (2 drum); Tunnel locomotive operator (over 30 tons)

GROUP 6: Heavy Duty Repairman

GROUP 7: Tunnel mole boring machine operator

ENGINEERS ZONES

$1.00 additional per hour for all of IMPERIAL County and the portions of KERN, RIVERSIDE & SAN BERNARDINO Counties as defined below:

That area within the following Boundary: Begin in San Bernardino County, approximately 3 miles NE of the intersection of I-15 and the California State line at that point which is the NW corner of Section 1, T17N,m R14E, San Bernardino Meridian. Continue W in a straight line to that point which is the SW corner of the northwest quarter of Section 6, T27S, R42E, Mt. Diablo Meridian. Continue North to the intersection with the Inyo County Boundary at that point which is the NE corner of the western half of the northern quarter of Section 6, T25S, R42E, MDM. Continue W along the Inyo and San Bernardino County boundary until the intersection with Kern County, as that point which is the SE corner of Section 34, T24S, R40E, MDM. Continue W along the Inyo and Kern County boundary until the intersection with Tulare County, at that point which is the SW corner of the SE quarter of Section 32, T24S, R37E, MDM. Continue W along the Kern and Tulare County boundary, until that point which is the NW corner of T25S, R32E, MDM. Continue S following R32E lines to the NW corner of T31S, R32E, MDM. Continue W to the NW corner of T31S, R31E, MDM. Continue S to the SW corner of T32S, R31E, MDM. Continue W to SW corner of SE quarter of Section 34, T32S, R30E, MDM. Continue S to SW corner of T11N, R17W, SBM. Continue E along south boundary of T11N, SBM to SW corner of T11N, R7W, SBM. Continue S to SW corner of T9N, R7W, SBM. Continue E along south boundary of T9N, SBM to SW corner of T9N, R1E, SBM. Continue S along west boundary of R1E, SMB to Riverside County line at the SW corner of T1S, R1E, SBM. Continue E along south boundary of T1s, SBM (Riverside County Line) to SW corner of T1S, R10E, SBM. Continue S along west boundary of R10E, SBM to Imperial County line at the SW corner of T8S, R10E, SBM. Continue W along Imperial and Riverside county line to NW corner of T9S, R9E, SBM. Continue S along the boundary between Imperial and San Diego Counties, along the west edge of R9E, SBM to the south boundary of Imperial County/California state line. Follow the California state line west to Arizona state line, then north to Nevada state line, then continuing NW back

to start at the point which is the NW corner of Section 1, T17N, R14E, SBM

$1.00 additional per hour for portions of SAN LUIS OBISPO, KERN, SANTA BARBARA & VENTURA as defined below:

That area within the following Boundary: Begin approximately 5 miles north of the community of Cholame, on the Monterey County and San Luis Obispo County boundary at the NW corner of T25S, R16E, Mt. Diablo Meridian. Continue south along the west side of R16E to the SW corner of T30S, R16E, MDM. Continue E to SW corner of T30S, R17E, MDM. Continue S to SW corner of T31S, R17E, MDM. Continue E to SW corner of T31S, R18E, MDM. Continue S along West side of R18E, MDM as it crosses into San Bernardino Meridian numbering area and becomes R30W. Follow the west side of R30W, SBM to the SW corner of T9N, R30W, SBM. Continue E along the south edge of T9N, SBM to the Santa Barbara County and Ventura County boundary at that point whch is the SW corner of Section 34.T9N, R24W, SBM, continue S along the Ventura County line to that point which is the SW corner of the SE quarter of Section 32, T7N, R24W, SBM. Continue E along the south edge of T7N, SBM to the SE corner to T7N, R21W, SBM. Continue N along East side of R21W, SBM to Ventura County and Kern County boundary at the NE corner of T8N, R21W. Continue W along the Ventura County and Kern County boundary to the SE corner of T9N, R21W. Continue North along the East edge of R21W, SBM to the NE corner of T12N, R21W, SBM. Continue West along the north edge of T12N, SBM to the SE corner of T32S, R21E, MDM. [T12N SBM is a think strip between T11N SBM and T32S MDM]. Continue North along the East side of R21E, MDM to the Kings County and Kern County border at the NE corner of T25S, R21E, MDM, continue West along the Kings County and Kern County Boundary until the intersection of San Luis Obispo County. Continue west along the Kings County and San Luis Obispo County boundary until the intersection with Monterey County. Continue West along the Monterey County and San Luis Obispo County boundary to the beginning point at the NW corner of T25S, R16E, MDM.

$2.00 additional per hour for INYO and MONO Counties and the Northern portion of SAN BERNARDINO County as defined below:

That area within the following Boundary: Begin at the intersection of the northern boundary of Mono County and the California state line at the point which is the center of Section 17, T10N, R22E, Mt. Diablo Meridian. Continue S then SE along the entire western boundary of Mono County, until it reaches Inyo County at the point which is the NE corner of the Western half of the NW quarter of Section 2, T8S, R29E, MDM. Continue SSE along the entire western boundary of Inyo County, until the intersection with Kern County at the point which is the SW corner of the SE 1/4 of Section 32, T24S, R37E, MDM. Continue E along the Inyo and Kern County boundary until the intersection with San Bernardino County at that point which is the SE corner of section 34, T24S, R40E, MDM. Continue E along the Inyo and San Bernardino County boundary until the point

which is the NE corner of the Western half of the NW quarter of Section 6, T25S, R42E, MDM. Continue S to that point which is the SW corner of the NW quarter of Section 6, T27S, R42E, MDM. Continue E in a straight line to the California and Nevada state border at the point which is the NW corner of Section 1, T17N, R14E, San Bernardino Meridian. Then continue NW along the state line to the starting point, which is the center of Section 18, T10N, R22E, MDM.

REMAINING AREA NOT DEFINED ABOVE RECIEVES BASE RATE

ENGI0012-004 08/01/2015

	Rates	Fringes
OPERATOR: Power Equipment (DREDGING)		
(1) Leverman	$ 49.50	23.60
(2) Dredge dozer	$ 43.53	23.60
(3) Deckmate	$ 43.42	23.60
(4) Winch operator (stern winch on dredge)	$ 42.87	23.60
(5) Fireman-Oiler, Deckhand, Bargeman, Leveehand	$ 42.33	23.60
(6) Barge Mate	$ 42.94	23.60

IRON0377-002 07/01/2016

	Rates	Fringes
Ironworkers:		
Fence Erector	$ 28.33	20.64
Ornamental, Reinforcing and Structural	$ 34.75	29.20

PREMIUM PAY:

$6.00 additional per hour at the following locations:

China Lake Naval Test Station, Chocolate Mountains Naval Reserve-Niland,
Edwards AFB, Fort Irwin Military Station, Fort Irwin Training Center-Goldstone, San Clemente Island, San Nicholas Island, Susanville Federal Prison, 29 Palms - Marine Corps, U.S. Marine Base - Barstow, U.S. Naval Air Facility - Sealey, Vandenberg AFB

$4.00 additional per hour at the following locations:

Army Defense Language Institute - Monterey, Fallon Air Base, Naval Post Graduate School - Monterey, Yermo Marine Corps Logistics Center

$2.00 additional per hour at the following locations:

Port Hueneme, Port Mugu, U.S. Coast Guard Station - Two Rock

LABO0089-001 07/18/2016

	Rates	Fringes
LABORER (BUILDING and all other Residential Construction)		
Group 1	$ 29.42	19.78
Group 2	$ 30.10	19.78
Group 3	$ 30.81	19.78
Group 4	$ 31.61	19.78
Group 5	$ 33.54	19.78
LABORER (RESIDENTIAL CONSTRUCTION - See definition below)		
(1) Laborer	$ 27.32	18.11
(2) Cleanup, Landscape, Fencing (Chain Link & Wood)	$ 26.03	18.11

RESIDENTIAL DEFINITION: Wood or metal frame construction of single family residences, apartments and condominums - excluding (a) projects that exceed three stories over a garage level, (b) any utility work such as telephone, gas, water, sewer and other utilities and (c) any fine grading work, utility work or paving work in the future street and public right-of-way; but including all rough grading work at the job site behind the existing right of way

LABORER CLASSIFICATIONS

GROUP 1: Cleaning and handling of panel forms; Concrete Screeding for Rought Strike-off; Concrete, water curing; Demolition laborer; Flagman; Gas, oil and/or water pipeline laborer; General Laborer; General clean-up laborer; Landscape laborer; Jetting laborer; Temporary water and air lines laborer; Material hoseman (walls, slabs, floors and decks); Plugging, filling of Shee-bolt holes; Dry packing of concrete; Railroad maintenance, Repair Trackman and road beds, Streetcar and railroad construction trac laborers; Slip form raisers; Slurry seal crews (mixer operator, applicator operator, squeegee man, Shuttle man, top man), filling of cracks by any method on any surface; Tarman and mortar man; Tool crib or tool house laborer; Window cleaner; Wire Mesh puling-all concrete pouring operations

GROUP 2: Asphalt Shoveler; Cement Dumper (on 1 yard or larger mixer and handling bulk cement); Cesspool digger and installer; Chucktender; Chute man, pouring concrete, the handling of the cute from ready mix trucks, such as walls, slabs, decks, floors, foundations, footings, curbs, gutters and sidewalks; Concrete curer-impervious membrane and form oiler; Cutting torch operator (demoliton); Guinea chaser;

Headboard man-asphlt; Laborer, packing rod steel and pans; membrane vapor barrier installer; Power broom sweepers (small); Riiprap, stonepaver, placing stone or wet sacked concrete; Roto scraper and tiller; Tank sealer and cleaner; Tree climber, faller, chain saw operator, Pittsburgh Chipper and similar type brush shredders; Underground laborers, including caisson bellower

GROUP 3: Buggymobile; Concrete cutting torch; Concrete cutting torch; Concrete pile cutter; Driller, jackhammer, 2 1/2 feet drill steel or longer; Dri Pak-it machine; High sealer (including drilling of same); Hydro seeder and similar type; Impact wrench, mult-plate; Kettlemen, potmen and mean applying asphalt, lay-kold, creosote, line caustic and similar type materials (applying means applying, dipping, brushing or handling of such materials for pipe wrapping and waterproofing); Operators of pneumatic, gas, electric tools, vibratring machines, pavement breakers, air blasting, come-along, and similar mechanical tools not separately classified herein; Pipelayers back up man coating, grouting, making of joints, sealing, caulking, diapering and inclduing rubber gasket joints, pointing and any and all other services; Rotary Scarifier or multiple head concrete chipping scaarifier; Steel header board man and guideline setter; Tampers, Barko, Wacker and similar type; Trenching machine, handpropelled

GROUP 4: Asphalt raker, luterman, ironer, apshalt dumpman and asphalt spreader boxes (all types); Concrete core cutter (walls, floors or ceilings), Grinder or sander; Concrete saw man; cutting walls or flat work, scoring old or new concrete; Cribber, shorer, lagging, sheeting and trench bracing, hand-guided lagging hammer; Laser beam in connection with laborer's work; Oversize concrete vibrator operator 70 pounds and over; Pipelayer performing all services in the laying, installation and all forms of connection of pipe from the point of receiving pipe in the ditch until completion of oepration, including any and all forms of tubular material, whether pipe, metallic or non-metallic, conduit, and any other stationary type of tubular device used for the conveying of any substance or element, whether water, sewage, solid, gas, air or other product whatsoever and without regard to the nature of material from which the tubular material is fabricated; No joint pipe and stripping of same; Prefabricated manhole installer; Sandblaster (nozzleman), Porta shot-blast, water blasting

GROUP 5: Blasters Powderman-All work of loading holes, placing and blasting of all pwder and explosives of whatever type, regardless of method used for such loading and placing; Driller-all power drills, excluding jackhammer, whether core, diamond, wagon, track, multiple unit, and any and all other types of mechanical drills without regard to the form of motive power.

LABO0089-002 11/01/2015

	Rates	Fringes
LABORER (MASON TENDER)	$ 29.12	15.39

LABO0089-004 07/03/2016

HEAVY AND HIGHWAY CONSTRUCTION

	Rates	Fringes
Laborers:		
Group 1	$ 30.54	19.73
Group 2	$ 31.00	19.73
Group 3	$ 31.41	19.73
Group 4	$ 32.25	19.73
Group 5	$ 36.37	19.73

LABORER CLASSIFICATIONS

GROUP 1: Laborer: General or Construction Laborer, Landscape Laborer. Asphalt Rubber Material Loader. Boring Machine Tender (outside), Carpenter Laborer (cleaning, handling, oiling & blowing of panel forms and lumber), Concrete Laborer, Concrete Screeding for rough strike-off, Concrete water curing. Concrete Curb & Gutter laborer, Certified Confined Space Laborer, Demolition laborer & Cleaning of Brick and lumber,Expansion Joint Caulking; Environmental Remediation, Monitoring Well, Toxic waste and Geotechnical Drill tender, Fine Grader, Fire Watcher, Limbers, Brush Loader, Pilers and Debris Handlers. flagman. Gas Oil and Water Pipeline Laborer. Material Hoseman (slabs, walls, floors, decks); Plugging, filling of shee bolt holes; Dry packing of concrete and patching; Post Holer Digger (manual); Railroad maintenance, repair trackman, road beds; Rigging & signaling; Scaler, Slip-Form Raisers, Filling cracks on any surface, tool Crib or Tool House Laborer, Traffic control (signs, barriers, barricades, delineator, cones etc.), Window Cleaner

GROUP 2: Asphalt abatement; Buggymobile; Cement dumper (on 1 yd. or larger mixers and handling bulk cement); Concrete curer, impervious membrane and form oiler; Chute man, pouring concrete; Concrete cutting torch; Concrete pile cutter; driller/Jackhammer, with drill steel 2 1/'2 feet or longer; Dry pak-it machine; Fence erector; Pipeline wrapper, gas, oil, water, pot tender & form man; Grout man; Installation of all asphalt overlay fabric and materials used for reinforcing asphalt; Irrigation laborer; Kettleman-Potman hot mop, includes applying asphalt, lay-klold, creosote, lime caustic and similar tyhpes of materials (dipping, brushing, handling) and waterproofing; Membrane vapor barrier installer; Pipelayer backup man (coating, grouting, making of joints, sealing caulkiing,

diapering including rubber basket joints, pointing); Rotary scarifier, multiple head concrete chipper; Rock slinger; Roto scraper & tiller; Sandblaster pot tender; Septic tank digger/installer; Tamper/wacker operator; Tank scaler & cleaner; Tar man & mortar man; Tree climber/faller, chainb saw operator, Pittsburgh chipper & similar type brush shredders.

GROUP 3: Asphalt, installation of all frabrics; Buggy Mobile Man, Bushing hammer; Compactor (all types), Concrete Curer - Impervious membrane, Form Oiler, Concrete Cutting Torch, Concrete Pile Cutter,Driller/Jackhammer with drill steel 2 1/2 ft or longer, Dry Pak-it machine, Fence erector including manual post hole digging, Gas oil or water Pipeline Wrapper - 6 ft pipe and over, Guradrail erector, Hydro seeder, Impact Wrench man (multi plate), kettleman-Potman Hot Mop includes applying Asphalt, Lay-Kold, Creosote, lime caustic and similar types of materials (dipping, brushing or handling) and waterproofing. Laser Beam in connection with Laborer work. High Scaler, Operators of Pneumatic Gas or Electric Tools, Vibrating Machines, Pavement Breakers, Air Blasting, Come-Alongs and similar mechanical tools, Remote-Controlled Robotic Tools in connection with Laborers work. Pipelayer Backup Man (Coating, grouting,m makeing of joints, sealing, caulking, diapering including rubber gasket joints, pointing and other services). Power Post Hole Digger, Rotary Scarifier (multiple head concrete chipper scarifier), Rock Slinger, Shot Blast equipment (8 to 48 inches), Steel Headerboard Man and Guideline Setter, Tamper/Wacker operator and similar types, Trenching Machine hand propelled.

GROUP 4: Any worker exposed to raw sewage. Asphalt Raker, Luteman, Asphalt Dumpman, Asphalt Spreader Boxes, Concrete Core Cutter, Concrete Saw Man, Cribber, Shorer, Head Rock Slinger. Installation of subsurface instrumentation, monitoring wells or points, remediation system installer; Laborer, asphalt-rubber distributor bootman; Oversize concrete vibrator operators, 70 pounds or over. Pipelayer, Prfefabricated Manhole Installer, Sandblast Nozzleman (Water Balsting-Porta Shot Blast), Traffic Lane Closure.

GROUP 5: Blasters Powderman-All work of loading holes, placing and blasting of all powder and explosives of whatever type, regardless of method used for such loading and placing; Horizontal directional driller, Boring system, Electronic traking, Driller: all power drills excluding jackhammer, whether core, diamond, wagon, track, multiple unit, and all other types of mechanical drills without regard to form of motive power. Environmental remediation, Monitoring well, Toxic waste and Geotechnical driller, Toxic waste removal. Welding in connection with Laborer's work.

LABO0300-005 01/01/2016

	Rates	Fringes
Asbestos Removal Laborer.....	$ 30.43	16.07

SCOPE OF WORK: Includes site mobilization, initial site cleanup, site preparation, removal of asbestos-containing material and toxic waste, encapsulation, enclosure and disposal of asbestos- containing materials and toxic waste by hand or with equipment or machinery; scaffolding, fabrication of temporary wooden barriers and assembly of decontamination stations.

LABO1184-001 07/04/2016

	Rates	Fringes
Laborers: (HORIZONTAL DIRECTIONAL DRILLING)		
(1) Drilling Crew Laborer...	$ 33.65	13.95
(2) Vehicle Operator/Hauler.	$ 33.82	13.95
(3) Horizontal Directional Drill Operator.....	$ 35.67	13.95
(4) Electronic Tracking Locator.....	$ 37.67	13.95
Laborers: (STRIPING/SLURRY SEAL)		
GROUP 1.....	$ 34.86	17.03
GROUP 2.....	$ 36.16	17.03
GROUP 3.....	$ 38.17	17.03
GROUP 4.....	$ 39.91	17.03

LABORERS - STRIPING CLASSIFICATIONS

GROUP 1: Protective coating, pavement sealing, including repair and filling of cracks by any method on any surface in parking lots, game courts and playgrounds; carstops; operation of all related machinery and equipment; equipment repair technician

GROUP 2: Traffic surface abrasive blaster; pot tender - removal of all traffic lines and markings by any method (sandblasting, waterblasting, grinding, etc.) and preparation of surface for coatings. Traffic control person: controlling and directing traffic through both conventional and moving lane closures; operation of all related machinery and equipment

GROUP 3: Traffic delineating device applicator: Layout and application of pavement markers, delineating signs, rumble and traffic bars, adhesives, guide markers, other traffic delineating devices including traffic control. This category includes all traffic related surface preparation (sandblasting, waterblasting, grinding) as part of the

application process. Traffic protective delineating system installer: removes, relocates, installs, permanently affixed roadside and parking delineation barricades, fencing, cable anchor, guard rail, reference signs, monument markers; operation of all related machinery and equipment; power broom sweeper

GROUP 4: Striper: layout and application of traffic stripes and markings; hot thermo plastic; tape traffic stripes and markings, including traffic control; operation of all related machinery and equipment

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LABO1414-003 08/03/2016

	Rates	Fringes
LABORER		
PLASTER CLEAN-UP LABORER	$ 31.60	19.28
PLASTER TENDER	$ 34.15	19.28

Work on a swing stage scaffold: $1.00 per hour additional.

Work at Military Bases - $3.00 additional per hour:
Coronado Naval Amphibious Base, Fort Irwin, Marine Corps Air Station-29 Palms, Imperial Beach Naval Air Station, Marine Corps Logistics Supply Base, Marine Corps Pickle Meadows, Mountain Warfare Training Center, Naval Air Facility-Seeley, North Island Naval Air Station, Vandenberg AFB.

PAIN0036-001 07/01/2015

	Rates	Fringes
Painters: (Including Lead Abatement)		
(1) Repaint (excludes San Diego County)	$ 27.29	12.83
(2) All Other Work	$ 30.72	12.83

REPAINT of any previously painted structure. Exceptions: work involving the aerospace industry, breweries, commercial recreational facilities, hotels which operate commercial establishments as part of hotel service, and sports facilities.

PAIN0036-010 10/01/2015

	Rates	Fringes
DRYWALL FINISHER/TAPER		
(1) Building & Heavy Construction	$ 27.84	15.20

(2) Residential
Construction (Wood frame
apartments, single family
homes and multi-duplexes
up to and including four
stories).....$ 21.00 13.91

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* PAIN0036-012 10/01/2016

	Rates	Fringes
GLAZIER	$ 41.55	11.93

PAIN0036-019 01/01/2016

	Rates	Fringes
SOFT FLOOR LAYER	$ 26.77	13.53

PLAS0200-005 08/06/2015

	Rates	Fringes
PLASTERER	$ 38.44	13.77

NORTH ISLAND NAVAL AIR STATION, COLORADO NAVAL AMPHIBIOUS BASE, IMPERIAL BEACH NAVAL AIR STATION: $3.00 additional per hour.

PLAS0500-001 07/01/2016

	Rates	Fringes
CEMENT MASON/CONCRETE FINISHER		
GROUP 1	$ 23.84	22.85
GROUP 2	$ 25.49	22.85
GROUP 3	$ 27.57	22.85

CEMENT MASONS - work inside the building line, meeting the following criteria:

GROUP 1: Residential wood frame project of any size; work classified as Type III, IV or Type V construction; interior tenant improvement work regardless the size of the project; any wood frame project of four stories or less.

GROUP 2: Work classified as type I and II construction

GROUP 3: All other work

PLUM0016-006 07/01/2016

	Rates	Fringes
PLUMBER, PIPEFITTER,		

STEAMFITTER
Camp Pendleton.....$ 51.69 21.41
Plumber and Pipefitter
All other work except work on new additions and remodeling of bars, restaurant, stores and commercial buildings not to exceed 5,000 sq. ft. of floor space and work on strip malls, light commercial, tenant improvement and remodel work.....$ 47.19 21.41
Work ONLY on new additions and remodeling of commercial buildings, bars, restaurants, and stores not to exceed 5,000 sq. ft. of floor space.....$ 45.73 20.43
Work ONLY on strip malls, light commercial, tenant improvement and remodel work.....$ 35.69 18.76

PLUM0016-011 07/01/2016

	Rates	Fringes
PLUMBER/PIPEFITTER		
Residential	$ 38.17	17.33

PLUM0345-001 07/01/2014

	Rates	Fringes
PLUMBER		
Landscape/Irrigation Fitter	$ 29.27	19.75
Sewer & Storm Drain Work	$ 33.24	17.13

ROOF0045-001 07/01/2012

	Rates	Fringes
ROOFER	$ 25.08	7.28

SFCA0669-001 04/01/2016

	Rates	Fringes
SPRINKLER FITTER	$ 37.67	19.56

SHEE0206-001 07/01/2015

	Rates	Fringes

SHEET METAL WORKER

Camp Pendleton	$ 37.55	23.23
Except Camp Pendleton	$ 35.33	23.23
Sheet Metal Technician	$ 25.22	6.69

SHEET METAL TECHNICIAN - SCOPE:
a. Existing residential buildings, both single and multi-family, where each unit is heated and/or cooled by a separate system b. New single family residential buildings including tracts. c. New multi-family residential buildings, not exceeding five stories of living space in height, provided each unit is heated or cooled by a separate system. Hotels and motels are excluded. d. LIGHT COMMERCIAL WORK: Any sheet metal, heating and air conditioning work performed on a project where the total construction cost, excluding land, is under $1,000,000 e. TENANT IMPROVEMENT WORK: Any work necessary to finish interior spaces to conform to the occupants of commercial buildings, after completion of the building shell

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TEAM0036-001 07/06/2015

	Rates	Fringes
Truck drivers:		
GROUP 1	$ 15.40	28.69
GROUP 2	$ 24.99	28.69
GROUP 3	$ 25.19	28.69
GROUP 4	$ 25.39	28.69
GROUP 5	$ 25.59	28.69
GROUP 6	$ 26.09	28.69
GROUP 7	$ 27.59	28.69

FOOTNOTE: HAZMAT PAY: Work on a hazmat job, where hazmat certification is required, shall be paid, in addition to the classification working in, as follows: Levels A, B and C - +$1.00 per hour. Workers shall be paid hazmat pay in increments of four (4) and eight (8) hours.

TRUCK DRIVER CLASSIFICATIONS

GROUP 1: Fuel Man, Swamper

GROUP 2: 2-axle Dump Truck, 2-axle Flat Bed,Concrete Pumping Truck, Industrial Lift Truck, Motorized Traffic Control, Pickup Truck on Jobsite

GROUP 3: 2-axle Water Truck, 3-axle Dump Truck, 3-axle Flat Bed, Erosion Control Nozzleman, Dump Crete Truck under 6.5 yd, Forklift 15,000 lbs and over, Prell Truck, Pipeline Work Truck Driver, Road Oil Spreader, Cement Distributor or Slurry Driver, Bootman, Ross Carrier

GROUP 4: Off-road Dump Truck under 35 tons 4-axles but less than 7-axles, Low-Bed Truck & Trailer, Transit Mix Trucks under 8 yd, 3-axle Water Truck, Erosion Control Driver,

Grout Mixer Truck, Dump Crete 6.5yd and over, Dumpster Trucks, DW 10, DW 20 and over, Fuel Truck and Dynamite, Truck Greaser, Truck Mounted Mobile Sweeper 2-axle Winch Truck

GROUP 5: Off-road Dump Truck 35 tons and over, 7-axles or more, Transit Mix Trucks 8 yd and over, A-Frame Truck, Swedish Cranes

GROUP 6: Off-Road Special Equipment (including but not limited to Water Pull Tankers, Athey Wagons, DJB, B70 Wuclids or like Equipment)

GROUP 7: Repairman

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

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Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (ii)).

The body of each wage determination lists the classification and wage rates that have been found to be prevailing for the cited type(s) of construction in the area covered by the wage determination. The classifications are listed in alphabetical order of "identifiers" that indicate whether the particular rate is a union rate (current union negotiated rate for local), a survey rate (weighted average rate) or a union average rate (weighted union average rate).

Union Rate Identifiers

A four letter classification abbreviation identifier enclosed in dotted lines beginning with characters other than "SU" or "UAVG" denotes that the union classification and rate were prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2014. PLUM is an abbreviation identifier of the union which prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. 07/01/2014 is the effective date of the most current negotiated rate, which in this example is July 1, 2014.

Union prevailing wage rates are updated to reflect all rate changes in the collective bargaining agreement (CBA) governing

this classification and rate.

Survey Rate Identifiers

Classifications listed under the "SU" identifier indicate that no one rate prevailed for this classification in the survey and the published rate is derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As this weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SULA2012-007 5/13/2014. SU indicates the rates are survey rates based on a weighted average calculation of rates and are not majority rates. LA indicates the State of Louisiana. 2012 is the year of survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. 5/13/2014 indicates the survey completion date for the classifications and rates under that identifier.

Survey wage rates are not updated and remain in effect until a new survey is conducted.

Union Average Rate Identifiers

Classification(s) listed under the UAVG identifier indicate that no single majority rate prevailed for those classifications; however, 100% of the data reported for the classifications was union data. EXAMPLE: UAVG-OH-0010 08/29/2014. UAVG indicates that the rate is a weighted union average rate. OH indicates the state. The next number, 0010 in the example, is an internal number used in producing the wage determination. 08/29/2014 indicates the survey completion date for the classifications and rates under that identifier.

A UAVG rate will be updated once a year, usually in January of each year, to reflect a weighted average of the current negotiated/CBA rate of the union locals from which the rate is based.

WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can be:

* an existing published wage determination
* a survey underlying a wage determination
* a Wage and Hour Division letter setting forth a position on a wage determination matter
* a conformance (additional classification and rate) ruling

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour Regional Office for the area in which the survey was conducted

because those Regional Offices have responsibility for the Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:

Branch of Construction Wage Determinations
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

2.) If the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

Wage and Hour Administrator
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3.) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

4.) All decisions by the Administrative Review Board are final.

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END OF GENERAL DECISION

DISADVANTAGED BUSINESS ENTERPRISE INFORMATION FORM

WATER SYSTEM NAME:	WATER SYSTEM NUMBER-PROJECT NUMBER:.
PROJECT DESCRIPTION:	PROJECT LOCATION:

PRIME CONTRACTOR INFORMATION

NAME/ADDRESS: Name of firm Contact person Address, City, Zip Phone Email ☐ DBE ☐ MBE ☐ WBE ☐ OTHER	TYPE OF CONTRACT ☐ ARCHITECT/ENGINEER(A/E) ☐ CONSTRUCTION ☐ SUPPLIER/SERVICE (S/S) AMOUNT OF CONTRACT/BID: $

SUBCONTRACTOR INFORMATION

☐ DBE ☐ MBE ☐ WBE ☐ OTHER ☐ SUBCONTRACTOR ☐ SUPPLIER/SERVICE ☐ JOINT VENTURE ☐ BROKER TYPE OF CONTRACT CONTRACT AMOUNT $	NAME /ADDRESS: Name of firm Contact person Address, City, Zip Phone Email
☐ DBE ☐ MBE ☐ WBE ☐ OTHER ☐ SUBCONTRACTOR ☐ SUPPLIER/SERVICE ☐ JOINT VENTURE ☐ BROKER TYPE OF CONTRACT CONTRACT AMOUNT $	NAME /ADDRESS: Name of firm Contact person Address, City, Zip Phone Email
☐ DBE ☐ MBE ☐ WBE ☐ OTHER ☐ SUBCONTRACTOR ☐ SUPPLIER/SERVICE ☐ JOINT VENTURE ☐ BROKER TYPE OF CONTRACT CONTRACT AMOUNT $	NAME /ADDRESS: Name of firm Contact person Address, City, Zip Phone Email

GOALS FOR MBE & WBE PARTICIPATION

	% MBE	% WBE
Construction	11%	4%
Supplies	2%	2%
Services	4%	2%
Equipment	2%	1%

FORM COMPLETED BY:

NAME	TITLE	PHONE
SIGNATURE	DATE	EMAIL

FAILURE TO COMPLETE AND SUBMIT THIS FORM WITH BID -WILL CAUSE THE BID TO BE REJECTED AS NON-RESPONSIVE

☐ Additional pages attached

DISADVANTAGED BUSINESS ENTERPRISE INFORMATION FORM

WATER SYSTEM NAME:

WATER SYSTEM NUMBER-PROJECT NUMBER: K-17-1401-DBB-3

PROJECT DESCRIPTION: 69th & Mohawk Pump Station

PROJECT LOCATION: San Diego, CA

PRIME CONTRACTOR INFORMATION

NAME/ADDRESS:
Name of firm: WEST COAST GENERAL CORP.
Contact person: DAVID DAVEY
Address: 13700 STOWE DRIVE, STE 100
City, Zip: POWAY, CA 92064
Phone: 619-561-4200
Email: DDAVEY@WCGCORP.COM

☐ DBE ☐ MBE ☐ WBE ☒ OTHER

TYPE OF CONTRACT
☐ ARCHITECT/ENGINEER(A/E)
☒ CONSTRUCTION
☐ SUPPLIER/SERVICE (S/S)

AMOUNT OF CONTRACT/BID: $ 9,919,114.65

SUBCONTRACTOR INFORMATION

☐ DBE ☐ MBE ☐ WBE ☐ OTHER
☐ SUBCONTRACTOR ☐ SUPPLIER/SERVICE
☐ JOINT VENTURE ☐ BROKER
TYPE OF CONTRACT
CONTRACT AMOUNT $

NAME /ADDRESS:
Name of firm
Contact person
Address,
City, Zip
Phone
Email

☐ DBE ☐ MBE ☐ WBE ☐ OTHER
☐ SUBCONTRACTOR ☐ SUPPLIER/SERVICE
☐ JOINT VENTURE ☐ BROKER
TYPE OF CONTRACT
CONTRACT AMOUNT $

NAME /ADDRESS:
Name of firm
Contact person
Address,
City, Zip
Phone
Email

☐ DBE ☐ MBE ☐ WBE ☐ OTHER
☐ SUBCONTRACTOR ☐ SUPPLIER/SERVICE
☐ JOINT VENTURE ☐ BROKER
TYPE OF CONTRACT
CONTRACT AMOUNT $

NAME /ADDRESS:
Name of firm
Contact person
Address,
City, Zip
Phone
Email

GOALS FOR MBE & WBE PARTICIPATION

	% MBE	% WBE
Construction	11%	4%
Supplies	2%	2%
Services	4%	2%
Equipment	2%	1%

FORM COMPLETED BY:

NAME: David Davey
TITLE: President
PHONE: 619.561.4200
SIGNATURE: [signature]
DATE: 2/23/17
EMAIL: ddavey@wcgcorp.com

FAILURE TO COMPLETE AND SUBMIT THIS FORM WITH BID - WILL CAUSE THE BID TO BE REJECTED AS NON-RESPONSIVE

☒ Additional pages attached

DISADVANTAGED BUSINESS ENTERPRISE INFORMATION FORM

WATER SYSTEM NAME:	WATER SYSTEM NUMBER-PROJECT NUMBER:.
PROJECT DESCRIPTION:	PROJECT LOCATION:

PRIME CONTRACTOR INFORMATION

NAME/ADDRESS:
Name of firm: WEST COAST GENERAL CORP.
Contact person: DAVID DAVEY
Address, City, Zip: 13700 STOWE DRIVE, STE 100, POWAY, CA 92064
Phone: 619-561-4200
Email: DDAVEY@WCGCORP.COM

☐ DBE ☐ MBE ☐ WBE ☒ OTHER

TYPE OF CONTRACT
☐ ARCHITECT/ENGINEER(A/E)
☒ CONSTRUCTION
☐ SUPPLIER/SERVICE (S/S)

AMOUNT OF CONTRACT/BID: $ SEE FRONT PAGE

SUBCONTRACTOR INFORMATION

☐ DBE ☐ MBE ☐ WBE ☒ OTHER
☒ SUBCONTRACTOR ☐ SUPPLIER/SERVICE
☐ JOINT VENTURE ☐ BROKER
TYPE OF CONTRACT: Construction
CONTRACT AMOUNT: $ 65,735.07

NAME /ADDRESS: American Asphalt South, Inc.
Name of firm
Contact person: Lyle Stone
Address, City, Zip: 14436 Santa Ana Ave. Fontana, CA 92337
Phone: 909-427-8276
Email: Ricke@americanasphaltsouth.com

☐ DBE ☐ MBE ☐ WBE ☐ OTHER
☐ SUBCONTRACTOR ☐ SUPPLIER/SERVICE
☐ JOINT VENTURE ☐ BROKER
TYPE OF CONTRACT
CONTRACT AMOUNT: $

NAME /ADDRESS:
Name of firm
Contact person
Address, City, Zip
Phone
Email

☐ DBE ☐ MBE ☐ WBE ☐ OTHER
☐ SUBCONTRACTOR ☐ SUPPLIER/SERVICE
☐ JOINT VENTURE ☐ BROKER
TYPE OF CONTRACT
CONTRACT AMOUNT: $

NAME /ADDRESS:
Name of firm
Contact person
Address, City, Zip
Phone
Email

GOALS FOR MBE & WBE PARTICIPATION

	% MBE	% WBE
Construction	11%	4%
Supplies	2%	2%
Services	4%	2%
Equipment	2%	1%

FORM COMPLETED BY:

NAME	TITLE	PHONE
SIGNATURE	DATE	EMAIL

FAILURE TO COMPLETE AND SUBMIT THIS FORM WITH BID -WILL CAUSE THE BID TO BE REJECTED AS NON-RESPONSIVE

☐ Additional pages attached

DISADVANTAGED BUSINESS ENTERPRISE INFORMATION FORM

WATER SYSTEM NAME:	WATER SYSTEM NUMBER-PROJECT NUMBER:
PROJECT DESCRIPTION:	PROJECT LOCATION:

PRIME CONTRACTOR INFORMATION

NAME/ADDRESS:
Name of firm: WEST COAST GENERAL CORP.
Contact person: DAVID DAVEY
Address, City, Zip: 13700 STOWE DRIVE, STE 100, POWAY, CA 92064
Phone: 619-561-4200
Email: DDAVEY@WCGCORP.COM

☐ DBE ☐ MBE ☐ WBE ☒ OTHER

TYPE OF CONTRACT
☐ ARCHITECT/ENGINEER(A/E)
☒ CONSTRUCTION
☐ SUPPLIER/SERVICE (S/S)

AMOUNT OF CONTRACT/BID: $ SEE FRONT PAGE

SUBCONTRACTOR INFORMATION

☐ DBE ☐ MBE ☐ WBE ☒ OTHER
☒ SUBCONTRACTOR ☐ SUPPLIER/SERVICE
☐ JOINT VENTURE ☐ BROKER
TYPE OF CONTRACT: Construction
CONTRACT AMOUNT: $ 39,970

NAME /ADDRESS:
Name of firm: Castle Rock Environmental, Inc.
Contact person: Kim
Address, City, Zip: 10040 Painter Ave. Santa Fe Springs, CA 90670
Phone: 562-941-9244
Email: Kim@castlerockenv.com

☐ DBE ☐ MBE ☐ WBE ☐ OTHER
☐ SUBCONTRACTOR ☐ SUPPLIER/SERVICE
☐ JOINT VENTURE ☐ BROKER
TYPE OF CONTRACT:
CONTRACT AMOUNT: $

NAME /ADDRESS:
Name of firm:
Contact person:
Address, City, Zip:
Phone:
Email:

☐ DBE ☐ MBE ☐ WBE ☐ OTHER
☐ SUBCONTRACTOR ☐ SUPPLIER/SERVICE
☐ JOINT VENTURE ☐ BROKER
TYPE OF CONTRACT:
CONTRACT AMOUNT: $

NAME /ADDRESS:
Name of firm:
Contact person:
Address, City, Zip:
Phone:
Email:

GOALS FOR MBE & WBE PARTICIPATION

	% MBE	% WBE
Construction	11%	4%
Supplies	2%	2%
Services	4%	2%
Equipment	2%	1%

FORM COMPLETED BY

NAME	TITLE	PHONE
SIGNATURE	DATE	EMAIL

FAILURE TO COMPLETE AND SUBMIT THIS FORM WITH BID -WILL CAUSE THE BID TO BE REJECTED AS NON-RESPONSIVE

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DISADVANTAGED BUSINESS ENTERPRISE INFORMATION FORM

WATER SYSTEM NAME:	WATER SYSTEM NUMBER-PROJECT NUMBER:
PROJECT DESCRIPTION:	PROJECT LOCATION:

PRIME CONTRACTOR INFORMATION

NAME/ADDRESS:
Name of firm
Contact person — WEST COAST GENERAL CORP.
Address, — DAVID DAVEY
City, Zip — 13700 STOWE DRIVE, STE 100
Phone — POWAY, CA 92064
Email — DDAVEY@WCGCORP.COM
619-561-4200

☐ DBE ☐ MBE ☐ WBE ☒ OTHER

TYPE OF CONTRACT
☐ ARCHITECT/ENGINEER(A/E)
☒ CONSTRUCTION
☒ SUPPLIER/SERVICE (S/S)

AMOUNT OF CONTRACT/BID:
$ SEE FRONT PAGE

SUBCONTRACTOR INFORMATION

☐ DBE ☒ MBE ☐ WBE ☐ OTHER
☒ SUBCONTRACTOR ☐ SUPPLIER/SERVICE
☐ JOINT VENTURE ☐ BROKER
TYPE OF CONTRACT CONSTRUCTION
CONTRACT AMOUNT $ 63,500

NAME /ADDRESS:
Name of firm COAST LANDSCAPING INC
Contact person ROLLAND MASON
Address, 2230 LA MIRADA DR. STE B
City, Zip VISTA 92081
Phone 760-436-6804
Email INFO@COASTLANDSCAPING.COM

☐ DBE ☐ MBE ☐ WBE ☐ OTHER
☐ SUBCONTRACTOR ☐ SUPPLIER/SERVICE
☐ JOINT VENTURE ☐ BROKER
TYPE OF CONTRACT
CONTRACT AMOUNT $

NAME /ADDRESS:
Name of firm
Contact person
Address,
City, Zip
Phone
Email

☐ DBE ☐ MBE ☐ WBE ☐ OTHER
☐ SUBCONTRACTOR ☐ SUPPLIER/SERVICE
☐ JOINT VENTURE ☐ BROKER
TYPE OF CONTRACT
CONTRACT AMOUNT $

NAME /ADDRESS:
Name of firm
Contact person
Address,
City, Zip
Phone
Email

GOALS FOR MBE & WBE PARTICIPATION

	% MBE	% WBE
Construction	11%	4%
Supplies	2%	2%
Services	4%	2%
Equipment	2%	1%

FORM COMPLETED BY:

NAME	TITLE	PHONE
SIGNATURE	DATE	EMAIL

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DISADVANTAGED BUSINESS ENTERPRISE INFORMATION FORM

WATER SYSTEM NAME:	WATER SYSTEM NUMBER-PROJECT NUMBER:.
PROJECT DESCRIPTION:	PROJECT LOCATION:

PRIME CONTRACTOR INFORMATION

NAME/ADDRESS:
Name of firm: WEST COAST GENERAL CORP.
Contact person: DAVID DAVEY
Address, City, Zip: 13700 STOWE DRIVE, STE 100, POWAY, CA 92064
Phone: 619-561-4200
Email: DDAVEY@WCGCORP.COM

☐ DBE ☐ MBE ☐ WBE ☒ OTHER

TYPE OF CONTRACT
☐ ARCHITECT/ENGINEER(A/E)
☒ CONSTRUCTION
☐ SUPPLIER/SERVICE (S/S)

AMOUNT OF CONTRACT/BID: $ SEE FRONT PAGE

SUBCONTRACTOR INFORMATION

☐ DBE ☒ MBE ☐ WBE ☐ OTHER
☒ SUBCONTRACTOR ☐ SUPPLIER/SERVICE
☐ JOINT VENTURE ☐ BROKER
TYPE OF CONTRACT: Construction
CONTRACT AMOUNT: $ 43,200

NAME /ADDRESS: E.L. Hobbs, Inc.
Name of firm
Contact person: Brian Enriquez
Address, City, Zip: 1900 Weld Blvd, Ste 215, El Cajon, CA 92020
Phone: 619-401-1708
Email: SHobbs@ELHobbsInc.com

☐ DBE ☐ MBE ☐ WBE ☐ OTHER
☐ SUBCONTRACTOR ☐ SUPPLIER/SERVICE
☐ JOINT VENTURE ☐ BROKER
TYPE OF CONTRACT
CONTRACT AMOUNT $

NAME /ADDRESS:
Name of firm
Contact person
Address, City, Zip
Phone
Email

☐ DBE ☐ MBE ☐ WBE ☐ OTHER
☐ SUBCONTRACTOR ☐ SUPPLIER/SERVICE
☐ JOINT VENTURE ☐ BROKER
TYPE OF CONTRACT
CONTRACT AMOUNT $

NAME /ADDRESS:
Name of firm
Contact person
Address, City, Zip
Phone
Email

GOALS FOR MBE & WBE PARTICIPATION

	% MBE	% WBE
Construction	11%	4%
Supplies	2%	2%
Services	4%	2%
Equipment	2%	1%

FORM COMPLETED BY:

NAME	TITLE	PHONE
SIGNATURE	DATE	EMAIL

FAILURE TO COMPLETE AND SUBMIT THIS FORM WITH BID -WILL CAUSE THE BID TO BE REJECTED AS NON-RESPONSIVE

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DISADVANTAGED BUSINESS ENTERPRISE INFORMATION FORM

WATER SYSTEM NAME:	WATER SYSTEM NUMBER-PROJECT NUMBER:
PROJECT DESCRIPTION:	PROJECT LOCATION:

PRIME CONTRACTOR INFORMATION

NAME/ADDRESS:
Name of firm: WEST COAST GENERAL CORP.
Contact person: DAVID DAVEY
Address: 13700 STOWE DRIVE, STE 100
City, Zip: POWAY, CA 92064
Phone: DDAVEY@WCGCORP.COM
Email: 619-561-4200

☐ DBE ☐ MBE ☐ WBE ☒ OTHER

TYPE OF CONTRACT
☐ ARCHITECT/ENGINEER(A/E)
☒ CONSTRUCTION
☐ SUPPLIER/SERVICE (S/S)

AMOUNT OF CONTRACT/BID: $ SEE FRONT PAGE

SUBCONTRACTOR INFORMATION

☐ DBE ☒ MBE ☐ WBE ☐ OTHER
☒ SUBCONTRACTOR ☐ SUPPLIER/SERVICE
☐ JOINT VENTURE ☐ BROKER
TYPE OF CONTRACT: Construction
CONTRACT AMOUNT: $ 107,785

NAME /ADDRESS:
Name of firm: Enviro Applications, Inc.
Contact person: Craig Smith
Address: 2831 Camino Del Rio South, Ste 214
City, Zip: San Diego, CA 92108
Phone: 619-291-3636
Email: CSmith@enviroapplications.com

☐ DBE ☐ MBE ☐ WBE ☐ OTHER
☐ SUBCONTRACTOR ☐ SUPPLIER/SERVICE
☐ JOINT VENTURE ☐ BROKER
TYPE OF CONTRACT
CONTRACT AMOUNT: $

NAME /ADDRESS:
Name of firm
Contact person
Address,
City, Zip
Phone
Email

☐ DBE ☐ MBE ☐ WBE ☐ OTHER
☐ SUBCONTRACTOR ☐ SUPPLIER/SERVICE
☐ JOINT VENTURE ☐ BROKER
TYPE OF CONTRACT
CONTRACT AMOUNT: $

NAME /ADDRESS:
Name of firm
Contact person
Address,
City, Zip
Phone
Email

GOALS FOR MBE & WBE PARTICIPATION

	% MBE	% WBE
Construction	11%	4%
Supplies	2%	2%
Services	4%	2%
Equipment	2%	1%

FORM COMPLETED BY:

NAME	TITLE	PHONE
SIGNATURE	DATE	EMAIL

FAILURE TO COMPLETE AND SUBMIT THIS FORM WITH BID WILL CAUSE THE BID TO BE REJECTED AS NON-RESPONSIVE

☐ Additional pages attached

DISADVANTAGED BUSINESS ENTERPRISE INFORMATION FORM

WATER SYSTEM NAME:	WATER SYSTEM NUMBER-PROJECT NUMBER:.
PROJECT DESCRIPTION:	PROJECT LOCATION:

PRIME CONTRACTOR INFORMATION

NAME/ADDRESS:
Name of firm
Contact person
Address,
City, Zip
Phone
Email

WEST COAST GENERAL CORP.
DAVID DAVEY
13700 STOWE DRIVE, STE 100
POWAY, CA 92064
DDAVEY@WCGCORP.COM
619-561-4200

☐ DBE ☐ MBE ☐ WBE ☒ OTHER

TYPE OF CONTRACT
☐ ARCHITECT/ENGINEER(A/E)
☒ CONSTRUCTION
☐ SUPPLIER/SERVICE (S/S)

AMOUNT OF CONTRACT/BID:
$ SEE FRONT PAGE

SUBCONTRACTOR INFORMATION

☐ DBE ☒ MBE ☐ WBE ☐ OTHER
☒ SUBCONTRACTOR ☐ SUPPLIER/SERVICE
☐ JOINT VENTURE ☐ BROKER
TYPE OF CONTRACT CONSTRUCTION
CONTRACT AMOUNT $ 80,289

NAME /ADDRESS:
Name of firm FERREIRA CONSTRUCTION CO, INC.
Contact person NICK DOBSON
Address, 15188 VISTA DELRIO AVE
City, Zip CHINO, CA 91710
Phone 909-548-9552
Email NCARTON@FERREIRACONSTRUCTION.COM

☐ DBE ☐ MBE ☐ WBE ☐ OTHER
☐ SUBCONTRACTOR ☐ SUPPLIER/SERVICE
☐ JOINT VENTURE ☐ BROKER
TYPE OF CONTRACT
CONTRACT AMOUNT $

NAME /ADDRESS:
Name of firm
Contact person
Address,
City, Zip
Phone
Email

☐ DBE ☐ MBE ☐ WBE ☐ OTHER
☐ SUBCONTRACTOR ☐ SUPPLIER/SERVICE
☐ JOINT VENTURE ☐ BROKER
TYPE OF CONTRACT
CONTRACT AMOUNT $

NAME /ADDRESS:
Name of firm
Contact person
Address,
City, Zip
Phone
Email

GOALS FOR MBE & WBE PARTICIPATION

	% MBE	% WBE
Construction	11%	4%
Supplies	2%	2%
Services	4%	2%
Equipment	2%	1%

FORM COMPLETED BY:

NAME	TITLE	PHONE
SIGNATURE	DATE	EMAIL

FAILURE TO COMPLETE AND SUBMIT THIS FORM WITH BID -WILL CAUSE THE BID TO BE REJECTED AS NON-RESPONSIVE

☐ Additional pages attached

DISADVANTAGED BUSINESS ENTERPRISE INFORMATION FORM

WATER SYSTEM NAME:	WATER SYSTEM NUMBER-PROJECT NUMBER:
PROJECT DESCRIPTION:	PROJECT LOCATION:

PRIME CONTRACTOR INFORMATION

NAME/ADDRESS:
Name of firm: WEST COAST GENERAL CORP.
Contact person: DAVID DAVEY
Address: 13700 STOWE DRIVE, STE 100
City, Zip: POWAY, CA 92064
Phone: DDAVEY@WCGCORP.COM
Email: 619-561-4200

☐ DBE ☐ MBE ☐ WBE ☒ OTHER

TYPE OF CONTRACT
☐ ARCHITECT/ENGINEER(A/E)
☒ CONSTRUCTION
☐ SUPPLIER/SERVICE (S/S)

AMOUNT OF CONTRACT/BID: $ SEE FRONT PAGE

SUBCONTRACTOR INFORMATION

☐ DBE ☒ MBE ☐ WBE ☐ OTHER
☒ SUBCONTRACTOR ☐ SUPPLIER/SERVICE
☐ JOINT VENTURE ☐ BROKER
TYPE OF CONTRACT: Construction
CONTRACT AMOUNT: $ 59,943

NAME /ADDRESS:
Name of firm: GT Door, Inc.
Contact person: Grant Hodge
Address: 10728 Prospect Ave, Suite E
City, Zip: Santee, CA
Phone: 619-448-3667
Email: CPR@GTDoorInc.com

☐ DBE ☐ MBE ☐ WBE ☐ OTHER
☐ SUBCONTRACTOR ☐ SUPPLIER/SERVICE
☐ JOINT VENTURE ☐ BROKER
TYPE OF CONTRACT:
CONTRACT AMOUNT: $

NAME /ADDRESS:
Name of firm:
Contact person:
Address:
City, Zip:
Phone:
Email:

☐ DBE ☐ MBE ☐ WBE ☐ OTHER
☐ SUBCONTRACTOR ☐ SUPPLIER/SERVICE
☐ JOINT VENTURE ☐ BROKER
TYPE OF CONTRACT:
CONTRACT AMOUNT: $

NAME /ADDRESS:
Name of firm:
Contact person:
Address:
City, Zip:
Phone:
Email:

GOALS FOR MBE & WBE PARTICIPATION

	% MBE	% WBE
Construction	11%	4%
Supplies	2%	2%
Services	4%	2%
Equipment	2%	1%

FORM COMPLETED BY:

NAME	TITLE	PHONE
SIGNATURE	DATE	EMAIL

FAILURE TO COMPLETE AND SUBMIT THIS FORM WITH BID -WILL CAUSE THE BID TO BE REJECTED AS NON-RESPONSIVE

☐ Additional pages attached

DISADVANTAGED BUSINESS ENTERPRISE INFORMATION FORM

WATER SYSTEM NAME:	WATER SYSTEM NUMBER-PROJECT NUMBER:
PROJECT DESCRIPTION:	PROJECT LOCATION:

PRIME CONTRACTOR INFORMATION

NAME/ADDRESS:
Name of firm: WEST COAST GENERAL CORP.
Contact person: DAVID DAVEY
Address, City, Zip: 13700 STOWE DRIVE, STE 100, POWAY, CA 92064
Phone: DDAVEY@WCGCORP.COM
Email: 619-561-4200

☐ DBE ☐ MBE ☐ WBE ☒ OTHER

TYPE OF CONTRACT
☐ ARCHITECT/ENGINEER(A/E)
☒ CONSTRUCTION
☐ SUPPLIER/SERVICE (S/S)

AMOUNT OF CONTRACT/BID: $ SEE FRONT PAGE

SUBCONTRACTOR INFORMATION

☐ DBE ☒ MBE ☐ WBE ☐ OTHER
☒ SUBCONTRACTOR ☐ SUPPLIER/SERVICE
☐ JOINT VENTURE ☐ BROKER
TYPE OF CONTRACT: Construction
CONTRACT AMOUNT: $ 16,300

NAME /ADDRESS: Hanson Electric, Inc.
Name of firm
Contact person: Christopher Hanson
Address, City, Zip: @ PO Box 1280 Lakeside, CA 92040 @ 1277 Buckwheat Trl, Campo, CA 91906
Phone: 619-328-5040
Email: HansonElectricSD@gmail.com

☐ DBE ☐ MBE ☐ WBE ☐ OTHER
☐ SUBCONTRACTOR ☐ SUPPLIER/SERVICE
☐ JOINT VENTURE ☐ BROKER
TYPE OF CONTRACT
CONTRACT AMOUNT: $

NAME /ADDRESS:
Name of firm
Contact person
Address,
City, Zip
Phone
Email

☐ DBE ☐ MBE ☐ WBE ☐ OTHER
☐ SUBCONTRACTOR ☐ SUPPLIER/SERVICE
☐ JOINT VENTURE ☐ BROKER
TYPE OF CONTRACT
CONTRACT AMOUNT: $

NAME /ADDRESS:
Name of firm
Contact person
Address,
City, Zip
Phone
Email

GOALS FOR MBE & WBE PARTICIPATION

	% MBE	% WBE
Construction	11%	4%
Supplies	2%	2%
Services	4%	2%
Equipment	2%	1%

FORM COMPLETED BY:

NAME	TITLE	PHONE
SIGNATURE	DATE	EMAIL

FAILURE TO COMPLETE AND SUBMIT THIS FORM WITH BID -WILL CAUSE THE BID TO BE REJECTED AS NON-RESPONSIVE

☐ Additional pages attached

DISADVANTAGED BUSINESS ENTERPRISE INFORMATION FORM

WATER SYSTEM NAME:	WATER SYSTEM NUMBER-PROJECT NUMBER:
PROJECT DESCRIPTION:	PROJECT LOCATION:

PRIME CONTRACTOR INFORMATION

NAME/ADDRESS:
Name of firm: WEST COAST GENERAL CORP.
Contact person: DAVID DAVEY
Address: 13700 STOWE DRIVE, STE 100
City, Zip: POWAY, CA 92064
Phone: DDAVEY@WCGCORP.COM
Email: 619-561-4200

☐ DBE ☐ MBE ☐ WBE ☒ OTHER

TYPE OF CONTRACT
☐ ARCHITECT/ENGINEER(A/E)
☒ CONSTRUCTION
☐ SUPPLIER/SERVICE (S/S)

AMOUNT OF CONTRACT/BID: $ SEE FRONT PAGE

SUBCONTRACTOR INFORMATION

☒ DBE ☒ MBE ☒ WBE ☐ OTHER
☐ SUBCONTRACTOR ☒ SUPPLIER/SERVICE
☐ JOINT VENTURE ☐ BROKER
TYPE OF CONTRACT: S/S
CONTRACT AMOUNT: $ 3,120

NAME /ADDRESS: Hudson Safe T Lite Rentals — Robcar Corp.
Name of firm
Contact person: Jaime
Address: 777 Gable Way
City, Zip: El Cajon, CA 92020
Phone: 619-441-8642
Email: Marcia@hudsonsafetlite.com

☐ DBE ☐ MBE ☐ WBE ☐ OTHER
☐ SUBCONTRACTOR ☐ SUPPLIER/SERVICE
☐ JOINT VENTURE ☐ BROKER
TYPE OF CONTRACT
CONTRACT AMOUNT: $

NAME /ADDRESS:
Name of firm
Contact person
Address,
City, Zip
Phone
Email

☐ DBE ☐ MBE ☐ WBE ☐ OTHER
☐ SUBCONTRACTOR ☐ SUPPLIER/SERVICE
☐ JOINT VENTURE ☐ BROKER
TYPE OF CONTRACT
CONTRACT AMOUNT: $

NAME /ADDRESS:
Name of firm
Contact person
Address,
City, Zip
Phone
Email

GOALS FOR MBE & WBE PARTICIPATION

	% MBE	% WBE
Construction	11%	4%
Supplies	2%	2%
Services	4%	2%
Equipment	2%	1%

FORM COMPLETED BY:

NAME	TITLE	PHONE
SIGNATURE	DATE	EMAIL

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DISADVANTAGED BUSINESS ENTERPRISE INFORMATION FORM

WATER SYSTEM NAME:	WATER SYSTEM NUMBER-PROJECT NUMBER:.
PROJECT DESCRIPTION:	PROJECT LOCATION:

PRIME CONTRACTOR INFORMATION

NAME/ADDRESS:
Name of firm: WEST COAST GENERAL CORP.
Contact person: DAVID DAVEY
Address: 13700 STOWE DRIVE, STE 100
City, Zip: POWAY, CA 92064
Phone: DDAVEY@WCGCORP.COM
Email: 619-561-4200

☐ DBE ☐ MBE ☐ WBE ☒ OTHER

TYPE OF CONTRACT
☐ ARCHITECT/ENGINEER(A/E)
☒ CONSTRUCTION
☐ SUPPLIER/SERVICE (S/S)

AMOUNT OF CONTRACT/BID: $ SEE FRONT PAGE

SUBCONTRACTOR INFORMATION

☐ DBE ☒ MBE ☒ WBE ☐ OTHER
☐ SUBCONTRACTOR ☒ SUPPLIER/SERVICE
☐ JOINT VENTURE ☐ BROKER
TYPE OF CONTRACT: S/S
CONTRACT AMOUNT: $ 18,950

NAME /ADDRESS: Loveless & Linton Consulting
Name of firm
Contact person: RebeKah Loveless
Address: 1421 West Lewis St.
City, Zip: San Diego, CA 92103
Phone: 619-922-0718
Email: rebeKah@loveless-linton.com

☐ DBE ☐ MBE ☐ WBE ☐ OTHER
☐ SUBCONTRACTOR ☐ SUPPLIER/SERVICE
☐ JOINT VENTURE ☐ BROKER
TYPE OF CONTRACT
CONTRACT AMOUNT $

NAME /ADDRESS:
Name of firm
Contact person
Address,
City, Zip
Phone
Email

☐ DBE ☐ MBE ☐ WBE ☐ OTHER
☐ SUBCONTRACTOR ☐ SUPPLIER/SERVICE
☐ JOINT VENTURE ☐ BROKER
TYPE OF CONTRACT
CONTRACT AMOUNT $

NAME /ADDRESS:
Name of firm
Contact person
Address,
City, Zip
Phone
Email

GOALS FOR MBE & WBE PARTICIPATION

	% MBE	% WBE
Construction	11%	4%
Supplies	2%	2%
Services	4%	2%
Equipment	2%	1%

FORM COMPLETED BY:

NAME	TITLE	PHONE
SIGNATURE	DATE	EMAIL

FAILURE TO COMPLETE AND SUBMIT THIS FORM WITH BID -WILL CAUSE THE BID TO BE REJECTED AS NON-RESPONSIVE

☐ Additional pages attached

DISADVANTAGED BUSINESS ENTERPRISE INFORMATION FORM

WATER SYSTEM NAME:	WATER SYSTEM NUMBER-PROJECT NUMBER:
PROJECT DESCRIPTION:	PROJECT LOCATION:

PRIME CONTRACTOR INFORMATION

NAME/ADDRESS:
Name of firm: WEST COAST GENERAL CORP.
Contact person: DAVID DAVEY
Address, City, Zip: 13700 STOWE DRIVE, STE 100, POWAY, CA 92064
Phone / Email: DDAVEY@WCGCORP.COM, 619-561-4200

☐ DBE ☐ MBE ☐ WBE ☒ OTHER

TYPE OF CONTRACT
☐ ARCHITECT/ENGINEER(A/E)
☒ CONSTRUCTION
☐ SUPPLIER/SERVICE (S/S)

AMOUNT OF CONTRACT/BID: $ SEE FRONT PAGE

SUBCONTRACTOR INFORMATION

☐ DBE ☒ MBE ☐ WBE ☐ OTHER
☒ SUBCONTRACTOR ☐ SUPPLIER/SERVICE
☐ JOINT VENTURE ☐ BROKER
TYPE OF CONTRACT: Construction
CONTRACT AMOUNT: $ 25,000

NAME /ADDRESS:
Name of firm: Magnesite Specialties, Inc.
Contact person: Nick Maston
Address, City, Zip: 8686 Production Ave, Suite A, San Diego, CA 92121
Phone / Email: 858-578-4186, sherese@magnesitespecialties.com

☐ DBE ☐ MBE ☐ WBE ☐ OTHER
☐ SUBCONTRACTOR ☐ SUPPLIER/SERVICE
☐ JOINT VENTURE ☐ BROKER
TYPE OF CONTRACT
CONTRACT AMOUNT: $

NAME /ADDRESS:
Name of firm
Contact person
Address, City, Zip
Phone / Email

☐ DBE ☐ MBE ☐ WBE ☐ OTHER
☐ SUBCONTRACTOR ☐ SUPPLIER/SERVICE
☐ JOINT VENTURE ☐ BROKER
TYPE OF CONTRACT
CONTRACT AMOUNT: $

NAME /ADDRESS:
Name of firm
Contact person
Address, City, Zip
Phone / Email

GOALS FOR MBE & WBE PARTICIPATION

	% MBE	% WBE
Construction	11%	4%
Supplies	2%	2%
Services	4%	2%
Equipment	2%	1%

FORM COMPLETED BY:

NAME	TITLE	PHONE
SIGNATURE	DATE	EMAIL

FAILURE TO COMPLETE AND SUBMIT THIS FORM WITH BID -WILL CAUSE THE BID TO BE REJECTED AS NON-RESPONSIVE

☐ Additional pages attached

DISADVANTAGED BUSINESS ENTERPRISE INFORMATION FORM

WATER SYSTEM NAME:	WATER SYSTEM NUMBER-PROJECT NUMBER:.
PROJECT DESCRIPTION:	PROJECT LOCATION:

PRIME CONTRACTOR INFORMATION

NAME/ADDRESS:
Name of firm WEST COAST GENERAL CORP.
Contact person DAVID DAVEY
Address, 13700 STOWE DRIVE, STE 100
City, Zip POWAY, CA 92064
Phone DDAVEY@WCGCORP.COM
Email 619-561-4200

☐ DBE ☐ MBE ☐ WBE ☒ OTHER

TYPE OF CONTRACT
☐ ARCHITECT/ENGINEER(A/E)
☒ CONSTRUCTION
☐ SUPPLIER/SERVICE (S/S)

AMOUNT OF CONTRACT/BID: $ SEE FRONT PAGE

SUBCONTRACTOR INFORMATION

☐ DBE ☒ MBE ☐ WBE ☐ OTHER
☒ SUBCONTRACTOR ☐ SUPPLIER/SERVICE
☐ JOINT VENTURE ☐ BROKER
TYPE OF CONTRACT S/S
CONTRACT AMOUNT $ 23,000.00

NAME /ADDRESS:
Name of firm MCA TECHNOLOGIES
Contact person JIM SEVALLA
Address, 15615 ALTON PARKWAY, STE 245
City, Zip IRVINE, CA 92618
Phone 949-783-3100
Email JIM@MCAT.COM

☐ DBE ☐ MBE ☐ WBE ☐ OTHER
☐ SUBCONTRACTOR ☐ SUPPLIER/SERVICE
☐ JOINT VENTURE ☐ BROKER
TYPE OF CONTRACT
CONTRACT AMOUNT $

NAME /ADDRESS:
Name of firm
Contact person
Address,
City, Zip
Phone
Email

☐ DBE ☐ MBE ☐ WBE ☐ OTHER
☐ SUBCONTRACTOR ☐ SUPPLIER/SERVICE
☐ JOINT VENTURE ☐ BROKER
TYPE OF CONTRACT
CONTRACT AMOUNT $

NAME /ADDRESS:
Name of firm
Contact person
Address,
City, Zip
Phone
Email

GOALS FOR MBE & WBE PARTICIPATION

	% MBE	% WBE
Construction	11%	4%
Supplies	2%	2%
Services	4%	2%
Equipment	2%	1%

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Name of firm: WEST COAST GENERAL CORP.
Contact person: DAVID DAVEY
Address, City, Zip: 13700 STOWE DRIVE, STE 100, POWAY, CA 92064
Phone: DDAVEY@WCGCORP.COM
Email: 619-561-4200

☐ DBE ☐ MBE ☐ WBE ☒ OTHER

TYPE OF CONTRACT
☐ ARCHITECT/ENGINEER(A/E)
☒ CONSTRUCTION
☐ SUPPLIER/SERVICE (S/S)

AMOUNT OF CONTRACT/BID:
$ SEE FRONT PAGE

SUBCONTRACTOR INFORMATION

☐ DBE ☒ MBE ☐ WBE ☐ OTHER
☐ SUBCONTRACTOR ☒ SUPPLIER/SERVICE
☐ JOINT VENTURE ☐ BROKER
TYPE OF CONTRACT: Service
CONTRACT AMOUNT: $ 26,062

NAME /ADDRESS:
Name of firm: Mountain Materials, Inc.
Contact person: JD Dolinger
Address, City, Zip: 1117 Tavern Rd, Alpine, CA. 91901
Phone: 619-445-4150
Email: steve@mountainmaterials.com

☐ DBE ☐ MBE ☐ WBE ☐ OTHER
☐ SUBCONTRACTOR ☐ SUPPLIER/SERVICE
☐ JOINT VENTURE ☐ BROKER
TYPE OF CONTRACT
CONTRACT AMOUNT $

NAME /ADDRESS:
Name of firm
Contact person
Address, City, Zip
Phone
Email

☐ DBE ☐ MBE ☐ WBE ☐ OTHER
☐ SUBCONTRACTOR ☐ SUPPLIER/SERVICE
☐ JOINT VENTURE ☐ BROKER
TYPE OF CONTRACT
CONTRACT AMOUNT $

NAME /ADDRESS:
Name of firm
Contact person
Address, City, Zip
Phone
Email

GOALS FOR MBE & WBE PARTICIPATION

	% MBE	% WBE
Construction	11%	4%
Supplies	2%	2%
Services	4%	2%
Equipment	2%	1%

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PROJECT DESCRIPTION:	PROJECT LOCATION:

PRIME CONTRACTOR INFORMATION

NAME/ADDRESS:
Name of firm: WEST COAST GENERAL CORP.
Contact person: DAVID DAVEY
Address: 13700 STOWE DRIVE, STE 100
City, Zip: POWAY, CA 92064
Phone: DDAVEY@WCGCORP.COM
Email: 619-561-4200

☐ DBE ☐ MBE ☐ WBE ☒ OTHER

TYPE OF CONTRACT
☐ ARCHITECT/ENGINEER(A/E)
☒ CONSTRUCTION
☐ SUPPLIER/SERVICE (S/S)

AMOUNT OF CONTRACT/BID: $ SEE FRONT PAGE

SUBCONTRACTOR INFORMATION

☐ DBE ☐ MBE ☐ WBE ☒ OTHER
☒ SUBCONTRACTOR ☐ SUPPLIER/SERVICE
☐ JOINT VENTURE ☐ BROKER
TYPE OF CONTRACT: Construction
CONTRACT AMOUNT: $ 72,920

NAME /ADDRESS:
Name of firm: National Corrosion
Contact person: Chris Tsutsui
Address: 5450 Katella Ave, Suite 102
City, Zip: Los Alamitos, CA 90720
Phone: 949-682-8117
Email: Ctsutsui@national-corrosion.com

☐ DBE ☐ MBE ☐ WBE ☐ OTHER
☐ SUBCONTRACTOR ☐ SUPPLIER/SERVICE
☐ JOINT VENTURE ☐ BROKER
TYPE OF CONTRACT
CONTRACT AMOUNT: $

NAME /ADDRESS:
Name of firm
Contact person
Address,
City, Zip
Phone
Email

☐ DBE ☐ MBE ☐ WBE ☐ OTHER
☐ SUBCONTRACTOR ☐ SUPPLIER/SERVICE
☐ JOINT VENTURE ☐ BROKER
TYPE OF CONTRACT
CONTRACT AMOUNT: $

NAME /ADDRESS:
Name of firm
Contact person
Address,
City, Zip
Phone
Email

GOALS FOR MBE & WBE PARTICIPATION

	% MBE	% WBE
Construction	11%	4%
Supplies	2%	2%
Services	4%	2%
Equipment	2%	1%

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PROJECT DESCRIPTION:	PROJECT LOCATION:

PRIME CONTRACTOR INFORMATION

NAME/ADDRESS:

Name of firm	WEST COAST GENERAL CORP.
Contact person	DAVID DAVEY
Address,	13700 STOWE DRIVE, STE 100
City, Zip	POWAY, CA 92064
Phone	DDAVEY@WCGCORP.COM
Email	619-561-4200

☐ DBE ☐ MBE ☐ WBE ☒ OTHER

TYPE OF CONTRACT
- ☐ ARCHITECT/ENGINEER(A/E)
- ☒ CONSTRUCTION
- ☐ SUPPLIER/SERVICE (S/S)

AMOUNT OF CONTRACT/BID: $ SEE FRONT PAGE

SUBCONTRACTOR INFORMATION

☐ DBE ☐ MBE ☐ WBE ☒ OTHER

☒ SUBCONTRACTOR ☐ SUPPLIER/SERVICE

☐ JOINT VENTURE ☐ BROKER

TYPE OF CONTRACT: Construction

CONTRACT AMOUNT: $ 142,059

NAME /ADDRESS:

Name of firm	Pacific Sound Control - C.E. Pickup Co, Inc.
Contact person	Ryan Castillo
Address,	2677 N. Main St, Suite 230
City, Zip	Santa Ana, CA 92705
Phone	714-277-1075
Email	DMCDaniel@CEPICKUP.COM

☐ DBE ☐ MBE ☐ WBE ☐ OTHER

☐ SUBCONTRACTOR ☐ SUPPLIER/SERVICE

☐ JOINT VENTURE ☐ BROKER

TYPE OF CONTRACT

CONTRACT AMOUNT: $

NAME /ADDRESS:
Name of firm
Contact person
Address,
City, Zip
Phone
Email

☐ DBE ☐ MBE ☐ WBE ☐ OTHER

☐ SUBCONTRACTOR ☐ SUPPLIER/SERVICE

☐ JOINT VENTURE ☐ BROKER

TYPE OF CONTRACT

CONTRACT AMOUNT: $

NAME /ADDRESS:
Name of firm
Contact person
Address,
City, Zip
Phone
Email

GOALS FOR MBE & WBE PARTICIPATION

	% MBE	% WBE
Construction	11%	4%
Supplies	2%	2%
Services	4%	2%
Equipment	2%	1%

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WATER SYSTEM NAME:	WATER SYSTEM NUMBER-PROJECT NUMBER:
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PRIME CONTRACTOR INFORMATION

NAME/ADDRESS:
Name of firm: WEST COAST GENERAL CORP.
Contact person: DAVID DAVEY
Address, City, Zip: 13700 STOWE DRIVE, STE 100, POWAY, CA 92064
Phone: DDAVEY@WCGCORP.COM
Email: 619-561-4200

☐ DBE ☐ MBE ☐ WBE ☒ OTHER

TYPE OF CONTRACT
☐ ARCHITECT/ENGINEER(A/E)
☒ CONSTRUCTION
☐ SUPPLIER/SERVICE (S/S)

AMOUNT OF CONTRACT/BID: $ SEE FRONT PAGE

SUBCONTRACTOR INFORMATION

☐ DBE ☒ MBE ☒ WBE ☐ OTHER
☒ SUBCONTRACTOR ☐ SUPPLIER/SERVICE
☐ JOINT VENTURE ☐ BROKER
TYPE OF CONTRACT: Construction
CONTRACT AMOUNT: $ 41,455

NAME /ADDRESS:
Name of firm: Paradigm Mechanical Corp.
Contact person: Scott Mahre
Address, City, Zip: 6550 Federal Blvd. Lemon Grove, CA 91945
Phone: 619-456-4562
Email: Paula@PMCContracting.com

☐ DBE ☐ MBE ☐ WBE ☐ OTHER
☐ SUBCONTRACTOR ☐ SUPPLIER/SERVICE
☐ JOINT VENTURE ☐ BROKER
TYPE OF CONTRACT
CONTRACT AMOUNT: $

NAME /ADDRESS:
Name of firm
Contact person
Address, City, Zip
Phone
Email

☐ DBE ☐ MBE ☐ WBE ☐ OTHER
☐ SUBCONTRACTOR ☐ SUPPLIER/SERVICE
☐ JOINT VENTURE ☐ BROKER
TYPE OF CONTRACT
CONTRACT AMOUNT: $

NAME /ADDRESS:
Name of firm
Contact person
Address, City, Zip
Phone
Email

GOALS FOR MBE & WBE PARTICIPATION

	% MBE	% WBE
Construction	11%	4%
Supplies	2%	2%
Services	4%	2%
Equipment	2%	1%

FORM COMPLETED BY:

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WATER SYSTEM NAME:	WATER SYSTEM NUMBER-PROJECT NUMBER:.
PROJECT DESCRIPTION:	PROJECT LOCATION:

PRIME CONTRACTOR INFORMATION

NAME/ADDRESS:
Name of firm: WEST COAST GENERAL CORP.
Contact person: DAVID DAVEY
Address, City, Zip: 13700 STOWE DRIVE, STE 100, POWAY, CA 92064
Phone / Email: DDAVEY@WCGCORP.COM

☐ DBE ☐ MBE ☐ WBE ☒ OTHER

TYPE OF CONTRACT
☐ ARCHITECT/ENGINEER(A/E)
☒ CONSTRUCTION
☐ SUPPLIER/SERVICE (S/S)

AMOUNT OF CONTRACT/BID:
$ SEE FRONT PAGE

SUBCONTRACTOR INFORMATION

☐ DBE ☒ MBE ☒ WBE ☐ OTHER
☒ SUBCONTRACTOR ☐ SUPPLIER/SERVICE
☐ JOINT VENTURE ☐ BROKER
TYPE OF CONTRACT: Construction
CONTRACT AMOUNT: $ 23,098

NAME /ADDRESS:
Name of firm: Payco Specialties, Inc.
Contact person: David Deshazo
Address: 120 North Second Ave
City, Zip: Chula Vista, CA 91910
Phone: 619-422-9204
Email: Rebecca@payco.biz

☐ DBE ☐ MBE ☐ WBE ☐ OTHER
☐ SUBCONTRACTOR ☐ SUPPLIER/SERVICE
☐ JOINT VENTURE ☐ BROKER
TYPE OF CONTRACT
CONTRACT AMOUNT $

NAME /ADDRESS:
Name of firm
Contact person
Address,
City, Zip
Phone
Email

☐ DBE ☐ MBE ☐ WBE ☐ OTHER
☐ SUBCONTRACTOR ☐ SUPPLIER/SERVICE
☐ JOINT VENTURE ☐ BROKER
TYPE OF CONTRACT
CONTRACT AMOUNT $

NAME /ADDRESS:
Name of firm
Contact person
Address,
City, Zip
Phone
Email

GOALS FOR MBE & WBE PARTICIPATION

	% MBE	% WBE
Construction	11%	4%
Supplies	2%	2%
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Equipment	2%	1%

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WATER SYSTEM NAME:	WATER SYSTEM NUMBER-PROJECT NUMBER:
PROJECT DESCRIPTION:	PROJECT LOCATION:

PRIME CONTRACTOR INFORMATION

NAME/ADDRESS:
Name of firm: WEST COAST GENERAL CORP.
Contact person: DAVID DAVEY
Address: 13700 STOWE DRIVE, STE 100
City, Zip: POWAY, CA 92064
Phone: DDAVEY@WCGCORP.COM
Email: 619-561-4200

☐ DBE ☐ MBE ☐ WBE ☒ OTHER

TYPE OF CONTRACT
☐ ARCHITECT/ENGINEER(A/E)
☒ CONSTRUCTION
☐ SUPPLIER/SERVICE (S/S)

AMOUNT OF CONTRACT/BID:
$ SEE FRONT PAGE

SUBCONTRACTOR INFORMATION

☐ DBE ☒ MBE ☒ WBE ☐ OTHER
☒ SUBCONTRACTOR ☐ SUPPLIER/SERVICE
☐ JOINT VENTURE ☐ BROKER
TYPE OF CONTRACT: CONSTRUCTION
CONTRACT AMOUNT: $ 228,245.60

NAME /ADDRESS:
Name of firm: R. DUGAN CONSTRUCTION INC.
Contact person: WENDY DUGAN
Address: 6157 MARLATT ST.
City, Zip: MIRA LOMA 91752
Phone: 951-360-7531
Email: WENDYD@RDUGANCONST.COM

☐ DBE ☐ MBE ☐ WBE ☐ OTHER
☐ SUBCONTRACTOR ☐ SUPPLIER/SERVICE
☐ JOINT VENTURE ☐ BROKER
TYPE OF CONTRACT
CONTRACT AMOUNT $

NAME /ADDRESS:
Name of firm
Contact person
Address,
City, Zip
Phone
Email

☐ DBE ☐ MBE ☐ WBE ☐ OTHER
☐ SUBCONTRACTOR ☐ SUPPLIER/SERVICE
☐ JOINT VENTURE ☐ BROKER
TYPE OF CONTRACT
CONTRACT AMOUNT $

NAME /ADDRESS:
Name of firm
Contact person
Address,
City, Zip
Phone
Email

GOALS FOR MBE & WBE PARTICIPATION

	% MBE	% WBE
Construction	11%	4%
Supplies	2%	2%
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PRIME CONTRACTOR INFORMATION

NAME/ADDRESS:
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Phone: DDAVEY@WCGCORP.COM
Email: 619-561-4200

☐ DBE ☐ MBE ☐ WBE ☒ OTHER

TYPE OF CONTRACT
☐ ARCHITECT/ENGINEER(A/E)
☒ CONSTRUCTION
☐ SUPPLIER/SERVICE (S/S)

AMOUNT OF CONTRACT/BID: $ SEE FRONT PAGE

SUBCONTRACTOR INFORMATION

☐ DBE ☒ MBE ☐ WBE ☐ OTHER
☒ SUBCONTRACTOR ☐ SUPPLIER/SERVICE
☐ JOINT VENTURE ☐ BROKER
TYPE OF CONTRACT: Construction
CONTRACT AMOUNT: $ 151,940

NAME /ADDRESS: Richardson Steel, Inc.
Name of firm
Contact person: Natalie Lautner
Address, City, Zip: 9102 Harness St. Spring Valley, CA 91977
Phone: 619-697-5892
Email: Natalie Lautner@RichardsonSteelInc.com

☐ DBE ☐ MBE ☐ WBE ☐ OTHER
☐ SUBCONTRACTOR ☐ SUPPLIER/SERVICE
☐ JOINT VENTURE ☐ BROKER
TYPE OF CONTRACT
CONTRACT AMOUNT: $

NAME /ADDRESS:
Name of firm
Contact person
Address, City, Zip
Phone
Email

☐ DBE ☐ MBE ☐ WBE ☐ OTHER
☐ SUBCONTRACTOR ☐ SUPPLIER/SERVICE
☐ JOINT VENTURE ☐ BROKER
TYPE OF CONTRACT
CONTRACT AMOUNT: $

NAME /ADDRESS:
Name of firm
Contact person
Address, City, Zip
Phone
Email

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	% MBE	% WBE
Construction	11%	4%
Supplies	2%	2%
Services	4%	2%
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Contact person: DAVID DAVEY
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Phone: 619-561-4200
Email: DDAVEY@WCGCORP.COM

☐ DBE ☐ MBE ☐ WBE ☒ OTHER

TYPE OF CONTRACT
☐ ARCHITECT/ENGINEER(A/E)
☒ CONSTRUCTION
☐ SUPPLIER/SERVICE (S/S)

AMOUNT OF CONTRACT/BID:
$ SEE FRONT PAGE

SUBCONTRACTOR INFORMATION

☐ DBE ☒ MBE ☐ WBE ☐ OTHER
☐ SUBCONTRACTOR ☒ SUPPLIER/SERVICE
☐ JOINT VENTURE ☐ BROKER
TYPE OF CONTRACT: S/S
CONTRACT AMOUNT: $ 52,000

NAME /ADDRESS:
Name of firm: SCST Inc.
Contact person: Lisa Katz
Address, City, Zip: 6280 Riverdale St. San Diego, CA 92120
Phone: 619-280-4321
Email: LKatz@scst.com

☐ DBE ☐ MBE ☐ WBE ☐ OTHER
☐ SUBCONTRACTOR ☐ SUPPLIER/SERVICE
☐ JOINT VENTURE ☐ BROKER
TYPE OF CONTRACT
CONTRACT AMOUNT: $

NAME /ADDRESS:
Name of firm
Contact person
Address, City, Zip
Phone
Email

☐ DBE ☐ MBE ☐ WBE ☐ OTHER
☐ SUBCONTRACTOR ☐ SUPPLIER/SERVICE
☐ JOINT VENTURE ☐ BROKER
TYPE OF CONTRACT
CONTRACT AMOUNT: $

NAME /ADDRESS:
Name of firm
Contact person
Address, City, Zip
Phone
Email

GOALS FOR MBE & WBE PARTICIPATION

	% MBE	% WBE
Construction	11%	4%
Supplies	2%	2%
Services	4%	2%
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Contact person: DAVID DAVEY
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City, Zip: POWAY, CA 92064
Phone: DDAVEY@WCGCORP.COM
Email: 619-561-4200

☐ DBE ☐ MBE ☐ WBE ☒ OTHER

TYPE OF CONTRACT
- ☐ ARCHITECT/ENGINEER(A/E)
- ☒ CONSTRUCTION
- ☐ SUPPLIER/SERVICE (S/S)

AMOUNT OF CONTRACT/BID: $ SEE FRONT PAGE

SUBCONTRACTOR INFORMATION

☒ DBE ☒ MBE ☐ WBE ☐ OTHER

☒ SUBCONTRACTOR ☐ SUPPLIER/SERVICE
☐ JOINT VENTURE ☐ BROKER

TYPE OF CONTRACT: Construction

CONTRACT AMOUNT: $ ~~75,537.50~~ 205,718.

NAME /ADDRESS:
Name of firm: Sealright Paving, Inc.
Contact person: Stephen Houston
Address: 9053 Olive Drive
City, Zip: Spring Valley, CA 91977
Phone: 619-465-7411
Email: Monique@sealrightpaving inc. com

☐ DBE ☐ MBE ☐ WBE ☐ OTHER

☐ SUBCONTRACTOR ☐ SUPPLIER/SERVICE
☐ JOINT VENTURE ☐ BROKER

TYPE OF CONTRACT

CONTRACT AMOUNT: $

NAME /ADDRESS:
Name of firm
Contact person
Address,
City, Zip
Phone
Email

☐ DBE ☐ MBE ☐ WBE ☐ OTHER

☐ SUBCONTRACTOR ☐ SUPPLIER/SERVICE
☐ JOINT VENTURE ☐ BROKER

TYPE OF CONTRACT

CONTRACT AMOUNT: $

NAME /ADDRESS:
Name of firm
Contact person
Address,
City, Zip
Phone
Email

GOALS FOR MBE & WBE PARTICIPATION

	% MBE	% WBE
Construction	11%	4%
Supplies	2%	2%
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Phone: 619- 561-4200
Email: DDAVEY@WCGCORP.COM

☐ DBE ☐ MBE ☐ WBE ☒ OTHER

TYPE OF CONTRACT
☐ ARCHITECT/ENGINEER(A/E)
☒ CONSTRUCTION
☐ SUPPLIER/SERVICE (S/S)

AMOUNT OF CONTRACT/BID:
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SUBCONTRACTOR INFORMATION

☐ DBE ☒ MBE ☐ WBE ☐ OTHER
☒ SUBCONTRACTOR ☐ SUPPLIER/SERVICE
☐ JOINT VENTURE ☐ BROKER
TYPE OF CONTRACT: CONSTRUCTION
CONTRACT AMOUNT: $ 177,183

NAME /ADDRESS:
Name of firm: Seled Masonry Contractor
Contact person: Leonard Mckinney
Address, City, Zip: 7864 Rhein Ct, Rancho Cucamonga, CA 91739
Phone: 909-463-4398
Email: Leonard.Mckinney@yahoo.com

☐ DBE ☐ MBE ☐ WBE ☐ OTHER
☐ SUBCONTRACTOR ☐ SUPPLIER/SERVICE
☐ JOINT VENTURE ☐ BROKER
TYPE OF CONTRACT
CONTRACT AMOUNT: $

NAME /ADDRESS:
Name of firm
Contact person
Address, City, Zip
Phone
Email

☐ DBE ☐ MBE ☐ WBE ☐ OTHER
☐ SUBCONTRACTOR ☐ SUPPLIER/SERVICE
☐ JOINT VENTURE ☐ BROKER
TYPE OF CONTRACT
CONTRACT AMOUNT: $

NAME /ADDRESS:
Name of firm
Contact person
Address, City, Zip
Phone
Email

GOALS FOR MBE & WBE PARTICIPATION

	% MBE	% WBE
Construction	11%	4%
Supplies	2%	2%
Services	4%	2%
Equipment	2%	1%

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NAME	TITLE	PHONE
SIGNATURE	DATE	EMAIL

FAILURE TO COMPLETE AND SUBMIT THIS FORM WITH BID -WILL CAUSE THE BID TO BE REJECTED AS NON-RESPONSIVE

☐ Additional pages attached

DISADVANTAGED BUSINESS ENTERPRISE INFORMATION FORM

WATER SYSTEM NAME:	WATER SYSTEM NUMBER-PROJECT NUMBER:
PROJECT DESCRIPTION:	PROJECT LOCATION:

PRIME CONTRACTOR INFORMATION

NAME/ADDRESS:
Name of firm: WEST COAST GENERAL CORP.
Contact person: DAVID DAVEY
Address, City, Zip: 13700 STOWE DRIVE, STE 100, POWAY, CA 92064
Phone: 619-561-4200
Email: DDAVEY@WCGCORP.COM

☐ DBE ☐ MBE ☐ WBE ☒ OTHER

TYPE OF CONTRACT
☐ ARCHITECT/ENGINEER(A/E)
☒ CONSTRUCTION
☐ SUPPLIER/SERVICE (S/S)

AMOUNT OF CONTRACT/BID:
$ SEE FRONT PAGE

SUBCONTRACTOR INFORMATION

☐ DBE ☒ MBE ☐ WBE ☐ OTHER
☒ SUBCONTRACTOR ☐ SUPPLIER/SERVICE
☐ JOINT VENTURE ☐ BROKER
TYPE OF CONTRACT: Construction
CONTRACT AMOUNT: $ 53,877

NAME /ADDRESS:
Name of firm: Simpson Sandblasting & Special Coatings, Inc
Contact person: Ryan
Address, City, Zip: 14665 Rancho Vista Dr. Fontana, CA 92335
Phone: 909-829-0000
Email: Ryan@simpsonsandblasting.com

☐ DBE ☐ MBE ☐ WBE ☐ OTHER
☐ SUBCONTRACTOR ☐ SUPPLIER/SERVICE
☐ JOINT VENTURE ☐ BROKER
TYPE OF CONTRACT
CONTRACT AMOUNT: $

NAME /ADDRESS:
Name of firm
Contact person
Address, City, Zip
Phone
Email

☐ DBE ☐ MBE ☐ WBE ☐ OTHER
☐ SUBCONTRACTOR ☐ SUPPLIER/SERVICE
☐ JOINT VENTURE ☐ BROKER
TYPE OF CONTRACT
CONTRACT AMOUNT: $

NAME /ADDRESS:
Name of firm
Contact person
Address, City, Zip
Phone
Email

GOALS FOR MBE & WBE PARTICIPATION

	% MBE	% WBE
Construction	11%	4%
Supplies	2%	2%
Services	4%	2%
Equipment	2%	1%

FORM COMPLETED BY

NAME	TITLE	PHONE
SIGNATURE	DATE	EMAIL

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☐ DBE ☐ MBE ☐ WBE ☒ OTHER

TYPE OF CONTRACT
☐ ARCHITECT/ENGINEER(A/E)
☒ CONSTRUCTION
☐ SUPPLIER/SERVICE (S/S)

AMOUNT OF CONTRACT/BID: $ SEE FRONT PAGE

SUBCONTRACTOR INFORMATION

☐ DBE ☒ MBE ☐ WBE ☐ OTHER
☒ SUBCONTRACTOR ☐ SUPPLIER/SERVICE
☐ JOINT VENTURE ☐ BROKER
TYPE OF CONTRACT: CONSTRUCTION
CONTRACT AMOUNT: $ 44,111

NAME /ADDRESS:
Name of firm: SYLVESTER ROOFING Co., Inc.
Contact person: Anthony Zaffuto
Address, City, Zip: 2255 Barham, Escondido, CA 92029
Phone: 760-743-0048
Email: WES@SYLVESTERROOFING.COM

☐ DBE ☐ MBE ☐ WBE ☐ OTHER
☐ SUBCONTRACTOR ☐ SUPPLIER/SERVICE
☐ JOINT VENTURE ☐ BROKER
TYPE OF CONTRACT
CONTRACT AMOUNT: $

NAME /ADDRESS:
Name of firm
Contact person
Address, City, Zip
Phone
Email

☐ DBE ☐ MBE ☐ WBE ☐ OTHER
☐ SUBCONTRACTOR ☐ SUPPLIER/SERVICE
☐ JOINT VENTURE ☐ BROKER
TYPE OF CONTRACT
CONTRACT AMOUNT: $

NAME /ADDRESS:
Name of firm
Contact person
Address, City, Zip
Phone
Email

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	% MBE	% WBE
Construction	11%	4%
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PROJECT DESCRIPTION:	PROJECT LOCATION:

PRIME CONTRACTOR INFORMATION

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Name of firm WEST COAST GENERAL CORP.
Contact person DAVID DAVEY
Address, 13700 STOWE DRIVE, STE 100
City, Zip POWAY, CA 92064
Phone DDAVEY@WCGCORP.COM
Email 619-561-4200

☐ DBE ☐ MBE ☐ WBE ☒ OTHER

TYPE OF CONTRACT
☐ ARCHITECT/ENGINEER(A/E)
☒ CONSTRUCTION
☐ SUPPLIER/SERVICE (S/S)

AMOUNT OF CONTRACT/BID:
$ SEE FRONT PAGE

SUBCONTRACTOR INFORMATION

☐ DBE ☒ MBE ☐ WBE ☐ OTHER
☒ SUBCONTRACTOR ☐ SUPPLIER/SERVICE
☐ JOINT VENTURE ☐ BROKER
TYPE OF CONTRACT CONSTRUCTION
CONTRACT AMOUNT $ 51,740

NAME /ADDRESS:
Name of firm TRADEMARK HOIST & CRANE
Contact person SIMON
Address, 1369 RIDGEWAY ST.
City, Zip POMONA 91768
Phone 909-455-0801
Email SIMONC@TRADEMARK-HOIST.COM

☐ DBE ☐ MBE ☐ WBE ☐ OTHER
☐ SUBCONTRACTOR ☐ SUPPLIER/SERVICE
☐ JOINT VENTURE ☐ BROKER
TYPE OF CONTRACT
CONTRACT AMOUNT $

NAME /ADDRESS:
Name of firm
Contact person
Address,
City, Zip
Phone
Email

☐ DBE ☐ MBE ☐ WBE ☐ OTHER
☐ SUBCONTRACTOR ☐ SUPPLIER/SERVICE
☐ JOINT VENTURE ☐ BROKER
TYPE OF CONTRACT
CONTRACT AMOUNT $

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City, Zip
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	% MBE	% WBE
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Supplies	2%	2%
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Email: 619-561-4200

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TYPE OF CONTRACT
☐ ARCHITECT/ENGINEER(A/E)
☒ CONSTRUCTION
☐ SUPPLIER/SERVICE (S/S)

AMOUNT OF CONTRACT/BID:
$ SEE FRONT PAGE

SUBCONTRACTOR INFORMATION

☐ DBE ☒ MBE ☐ WBE ☐ OTHER
☒ SUBCONTRACTOR ☐ SUPPLIER/SERVICE
☐ JOINT VENTURE ☐ BROKER
TYPE OF CONTRACT: Construction
CONTRACT AMOUNT: $ 902,998

NAME /ADDRESS: US Controls, Inc.
Name of firm
Contact person: M Nunez
Address,: 2324 South Vineyard Ave, #K
City, Zip: Ontario, CA 91761
Phone: 909-999-8109
Email: MNunez@us-controls.com

☐ DBE ☐ MBE ☐ WBE ☐ OTHER
☐ SUBCONTRACTOR ☐ SUPPLIER/SERVICE
☐ JOINT VENTURE ☐ BROKER
TYPE OF CONTRACT
CONTRACT AMOUNT: $

NAME /ADDRESS:
Name of firm
Contact person
Address,
City, Zip
Phone
Email

☐ DBE ☐ MBE ☐ WBE ☐ OTHER
☐ SUBCONTRACTOR ☐ SUPPLIER/SERVICE
☐ JOINT VENTURE ☐ BROKER
TYPE OF CONTRACT
CONTRACT AMOUNT: $

NAME /ADDRESS:
Name of firm
Contact person
Address,
City, Zip
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Email

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Construction	11%	4%
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SIGNATURE	DATE	EMAIL

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☐ Additional pages attached

City of San Diego

CITY CONTACT: Michelle Muñoz, **Contract Specialist, Email:** MichelleM@sandiego.gov
Phone No. (619) 533-3482, **Fax No.** (619) 533-3633

ADDENDUM "B"

e - Bidding **FOR**

69TH & Mohawk Pump Station

BID NO.:	K-17-1401-DBB-3
SAP NO. (WBS/IO/CC):	S-12011
CLIENT DEPARTMENT:	2000
COUNCIL DISTRICT:	9
PROJECT TYPE:	BJ

BID DUE DATE:

2:00 PM
DECEMBER 15, 2016
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:

1) Registered Engineer — 11/16/16 Date — Seal:

2) For City Engineer — 11/18/16 Date — Seal:

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.

THE SUBMITTAL DATE FOR THIS PROJECT HAS BEEN **EXTENDED AS STATED ON THE COVER PAGE.**

B. BIDDER's QUESTIONS

Q1. There are several items of electrical utility work shown on the drawings that may conflict with SDG&E standards.

Ref. Project Drawings: E-3 Electrical Site Plan, E-6 Electrical Power Floor Plan, E-8 Electrical Single Line Diagram, E-14 Electrical Power Conduit Schedule

- The drawings indicate the Contractor is providing the 2000 KVA Service Transformer, typically this Transformer is provided by SDG&E, with the precast concrete transformer pad by the Contractor.
- The Conduit Schedule shows conduit with cable for the primary run between the service pole and service transformer, typically SDG&E provides cabling with conduit only by the Contractor.
- The Conduit Schedule shows conduit with cable for the secondary service run between the service transformer and service metering switchboard "SE-1", typically SDG&E provides cabling with conduit only by the Contractor.
- The Conduit Schedule shows PVC Coated RGS for the Primary Run E001, while referenced Detail-2 on Drawing-8 shows SCH-40 PVC Conduit.

These items are normally addressed in SDG&E's project Work Order.

Has SDG&E planning been contacted to prepare a design for the project?

If these items are not clarified prior to bid should SDG&E standards prevail for the electrical utility work?

A1. Refer to revised drawings E-3, E-6, E-8, E-13 and E-14 included with this Addendum. SDG&E has been contacted to prepare the design and their design requirements have been incorporated in the revised drawings.

Q2. The existing masonry wall on the east side of the property may be in conflict with construction of the new masonry wall.

A2. The existing masonry wall along the east side of the property is designated to remain. The contractor will be required to excavate and expose the existing wall footing (on the west side of the wall only) and determine its position relative to the new masonry wall. Contractor will be required to remove the existing concrete wall footing, as required, to install the new wall. Contractor shall be required to adequately support the existing masonry wall during construction. Backfill between the walls up to original grade on the west side shall use CLSM.

Once the existing wall footing is exposed, the City may elect to re-configure the footing dimensions for the new masonry wall (reference detail 1, sheet S-20) as well as alter the new wall's location.

Q3. Can you please provide us as builds of the existing block wall on the east side of the site?

It appears that constructing the new east wall will be impossible as the detail on sheet S20 indicates that the footing of the new wall shall be within 2" from the property line and sheet C6 shows the property line on the east side of the Existing Blockwall that remains in place, please clarify? Also drawing C7 indicates that parts of the bottom of footing will be 7'-7" below existing grade and with only 2" of separation from the property line it doesn't seem to be enough room for shoring, please clarify?

A3. No as-builts available for the block wall on the east side of the pump station site. See response to Question 2.

Q4. RFI: EAST SITE WALL

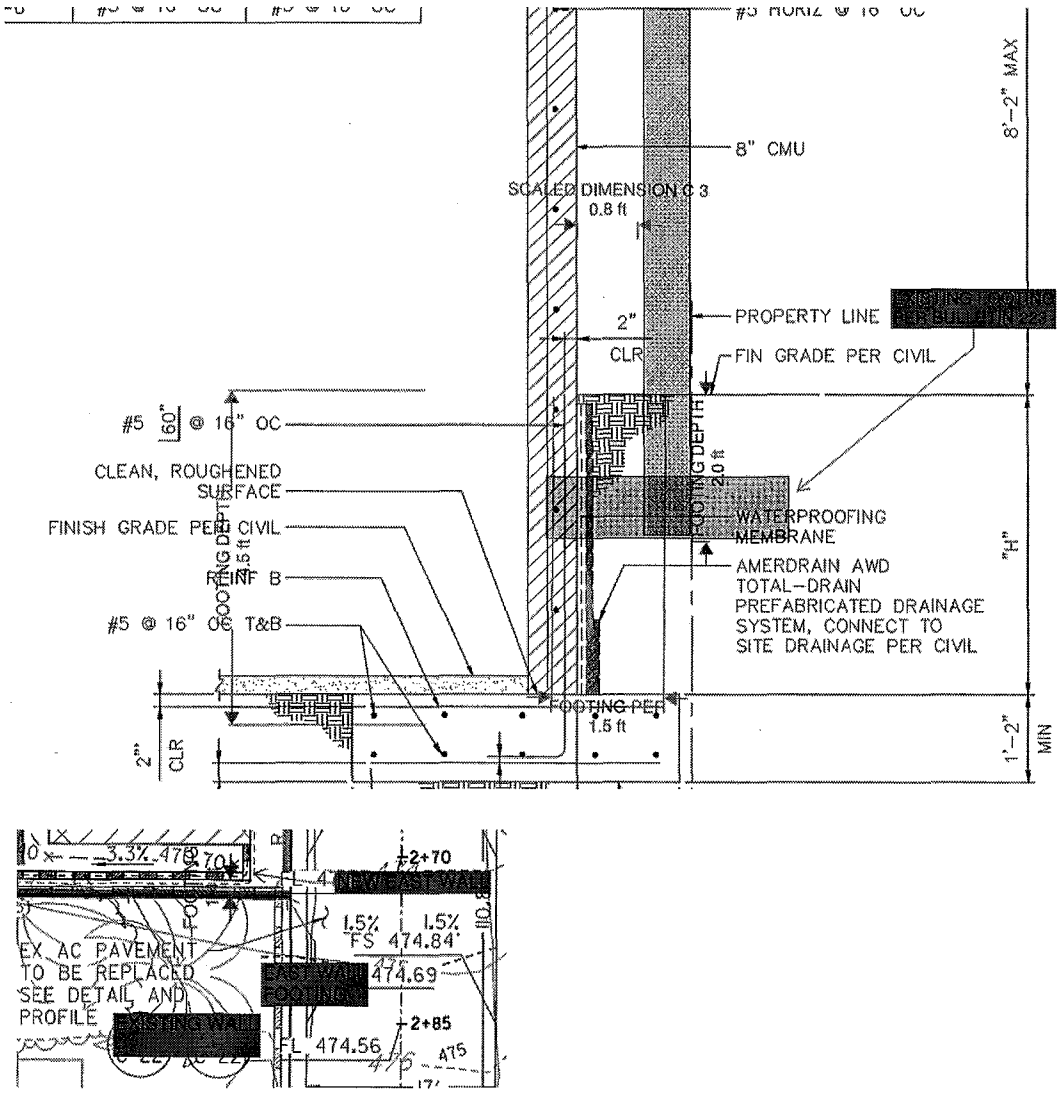
The distance between the proposed east wall and the existing retaining wall on Sheet 05 C1 measures 0.8 feet from face of wall to face of wall.

Sheet 94 S 20 shows the east wall footing 1.5 from the property line. Based on the dimension shown on Sheet 5 C1 and Sheet 94 S20 the proposed east wall footing would be under the center of the existing retaining wall.

Per City of San Diego Bulletin 223 a permit is not required for a masonry fence, but it does require a 2 FT deep footing with 1 FT of cover. Based on the requirements of Bulletin 223 the footing for the existing wall should be 2.92 FT wide.

Based on the sketch below there is not enough room to install a support system for the existing wall and construct the new east wall.

Is the City planning on moving the east wall further west?



A4. See response to Question 2.

Q5. Several sections of the Technical Specifications refer to the Standard Specifications for Public Works Construction (Whitebook) 2015 Edition.

A5. The project is subject to the requirements of the 2012 Edition of Standard Specifications for Public Works Construction (Greenbook and White) and Supplementary Special Provisions.

Q6. Is there a spec for the window/louver product shown on A-5?

A6. Refer to window and louver details on drawings A-8 and A-9.

Q7. I've been asked to provide a proposal for Survey Staking on the above referenced project. Do you know if the city will be doing their own surveying on this or if the contractor is required to provide survey? I couldn't find it in the specs.

A7. The City will provide construction surveying services.

Q8. Supplementary Special Provisions Section 8-2.1 requires the contractor furnish a Class A field office 10 x 60. Given the small footprint of the site would the City consider a rental space offsite for the trailer or office suite?

A8. The City takes no exception to rental office space within ½ mile of the pump station site in lieu of an on-site Class A office trailer.

Q9. Based on the borings with proper technique the native material should meet the compaction requirements as well as the expansion index limits. Section 02200 2.01 G states imported granular material "shall" be used within the Pipe Zone and the Trench Zones.

G. Imported Granular Material.

1. Imported granular material shall be used within the Pipe and Trench Zones and as backfill below and around concrete vaults and manholes and other locations as indicated on the drawings. Imported granular material shall be installed a minimum of 3 feet from the outside edge of the structure, all around the structure, and to the full depth (and below as required) of the structure.

If the native soil meets the requirements for compaction, granular size, and expansion index, will imported granular fill be required in the Trench Zone or Pipe Zone?

A9. (MBI response): Native material is not permitted for bedding material in the pipe zone. Bedding material shall conform to Standard Drawing SDW-110. Native material may be used as backfill in accordance with the specifications.

Q10. Sheet C-10, Note 2: per this plan/profile sheet a '30" x 16" Tee' is called out @ STA 13+45.60; alternatively per detail C/C-25 this same connection is drawn & called out as a '30" x 16" Cross'. Which is it to be?

A10. See revised drawings included with this addendum.

Q11. Sheet C-11, Note 6: per this plan/profile sheet the note is calling for 20" PVC pipe from the new tee connection @ STA 24+00.60 to the existing 20" valve located 45' to the left; detail A/C-26 is showing this to be 20" CML&TC welded steel pipe. Which is it to be?

A11. See revised drawings included with this addendum.

Q12. Sheet C-22, Details 5 & 6: confirm these details are to supersede SDSD SDW-159 & SDW-145

A12. See revised drawings included with this addendum.

Q13. Sheet C-27: confirm the *'Side Outlet Reinforcing Table'* located on this sheet supersedes requirements set forth per SDSD SDW-101

A13. The information shown on the Side Outlet Reinforcing Table may be used in lieu of similar requirements on SDS SDW-101. All other requirements on SDSD SDW-101 shall remain in force.

Q14. Spec (Section 09873-3.07.B) requires rubber padded saddles w/ 60° of contact to each pipe. Should we assume that flat bottom saddles on the 2nd tier would be acceptable provided that the bottoms of pipe on this tier are supported for the entire 60° contact arc?

Otherwise we will need to ship only 1 tier of pipe per load with will double the cost for freight.

Please clarify.

A14. Multi-stacking of pipe during transport is acceptable provided that each pipe section is supported as described in Section 09873-3.07.B

Q15. On drawing A-1, lines B2, D2 there is a call out for wall type 5. There is not a finish 5 shown on A-10. Please clarify.

A15. Refer to the Finish Schedule on drawing A-8.

Q16. On drawing S-11 there is a call out for detail 5/S-17 at lines A between 2 and 3 and on line I between 1 and 2. The one on line A says typical and makes sense to the shown detail with a beam showing. I believe this is above a window or louver. I also believe the intent is for that beam on all or most of the louver or door openings. Is that correct? If so what size is that beam? Is the detail shown on line I in the correct place? Please clarify.

A16. Detail 5/S-17 is typical for roof framing members extending beyond the wall to support the eave and fascia. It is shown in the correct location on the plan. Window and/or door locations are not relevant. Beam sizes are noted on the plan (W8x10 at Gridline A, W8x15 at Gridline I).

Q17. On drawing S-11, where are key notes #1 and #3 shown?

A17. Keynotes #1 and #3 are no longer applicable on this drawing and can be omitted.

Q18. Stainless steel Detectable warning tiles are required for all streets except residential streets. It is required on residential streets also if the development is part of a mix use or non-residential zones.

A18. Please refer to SDG-130 Note 3.

Q19. Can you please give details for the 5000sf continental crosswalk in bid item 73?

A19. Continental crosswalk detail is per City of San Diego Standard Drawing SDM-116. It was issued in the 2016 version of the Standard Drawing but it was approved for use for the Contracts that went under the 2012 City of San Diego Standard Drawings. Refer to the City website for Approved For Use – 2012 Standard Drawings. https://www.sandiego.gov/publicworks/edocref/standarddraw/updates.

Q20. Sheet C-22, Edge Detail shows 2 x 6 Treated Wood Header to be installed, will the treated header be installed around the entire perimeter of the DG or only against the AC section as shown in detail 7.

A20. The header is needed at all locations where the asphalt paving does not meet up with the building, concrete or masonry wall, such as planter and decomposed granite areas

Q21. The Traffic Control Legend shows a symbol regarding remove and salvage to the City of San Diego. There doesn't seem to be anything on the Traffic Control Plans that references this symbol, please clarify.

A21. Disregard legend items not specifically identified on the Traffic Control Plans.

Q22. The Improvement Sheets shows a DG Walkway, please provide a detail for the DG Walkway to obtain the thickness of the DG and all other materials required for placement.

A22. Refer to Detail A on Drawing L2.3.

Q23. Sheet D-1, Demo and Remove Existing Fence and Retaining Wall. Will the Footing be required to be removed, If so please provide details for the existing fence footings and Retaining Wall Footing

A23. Details for the existing walls and footings are not available. Contractor shall be responsible for removal and disposal of wall and footing materials.

Q24. Sheet D-1, Demo and Remove Existing Tank, What type of Tank is this, What material is inside, Is the Material Hazardous, Please Advise?

A24. The existing tank is a welded steel tank used previously as a surge tank. It is empty inside.

Q25. Sheet D-1, Demo and Remove Existing Tank, Is there a Foundation or Footings for the Existing Tank. Please provide Structural Details of Footings and or Foundation for the Tank to be removed.

A25. Details for the existing walls and footings are not available. Contractor shall be responsible for removal and disposal of the foundation and footing materials.

Q26. Sheet D-1, What is the Existing Thickness of the Asphalt Gravel to be Removed at the existing site?

A26. Details for the existing asphalt and gravel are not available. Contractor shall be responsible for removal and disposal of all such materials. Refer to Appendix L, Geotechnical Study for available information.

Q27. Sheets C-2 and C-3 show a Bio-filtration Section to be installed. Per these sheets, please provide the horizontal limits of the bio-filtration basin.

A27. The limits of the bio-filtration basin shall fit within the horizontal control plan shown on drawing C-5 and grading plan shown on drawings C-1, C-2 and C-3.

Q28. Sheets C-30 through C-32 show Curb Ramps to removed and replaced. What is the existing street section to be removed and what is the structural section required when replacing the AC and Aggregates at these location, please clarify?

A28. Details for the existing asphalt and aggregate base section are not available. Contractor shall be responsible for removal and disposal of all such materials and replacement to match existing. Refer to Appendix L, Geotechnical Study for available information.

Q29. Sheet L2.2 shows 'Trophy Gold'/3/4" minus/3" Depth, to be placed where the DG Walkway is to be located per sheet C-4. Is this gravel mulch required to be placed in the DG Walkway, please clarify?

A29. Gravel mulch is not required in the area designated as the DG walkway.

Q30. Sheet A-3, shows to place acoustic panels to the steel beams at the roof and a portion of the CMU Walls. Please Clarify if the Acoustical Panels to be placed on the CMU walls will be placed from Top of Ceiling to the Top of Floor, detail 6 and 12 on Sheet A-10 do not clearly define the locations of the Acoustic Panels to be placed?

A30. Where acoustical wall panels are indicated, the panels shall extend from 12 inches above the floor slab to the top of the masonry allowing for anchorage clearance.

Q31. At decorative site walls, are the split face and ground face textures to be on both sides of the wall or just one side? If it is one side which side is to receive the texture?

A31. Provide texture at both sides of site walls, except at Generator Enclosure. Provide texture at exterior side only at Generator Enclosure.

Q32. Concerning the integral water repellent in the CMU. Does the site walls require the water repellent additive usually used on building structures and not for site work? The building is plastered on the exterior, does the CMU for the building require water repellent since it is not exposed to the elements?

A32. Water Repellent not required at site walls or building walls.

Q33. Bid Item 4 calls out for generator installation however there is no spec for the generator. Is this supplied by the owner?

A33. Generator to be furnished by the City.

Q34. Bid item 30 calls out removal and replace of 1000 sf of existing sidewalk. Is this the existing amount at the current pump station?

A34. Yes, inclusive of sidewalk and driveways.

Q35. Bid item 91 calls out 2800 lf of archeological and Native American Monitoring program, is this supposed to be an allowance item? If not can you please explain the meaning and quantity?

A35. Refer to estimated monitoring limits indicated on drawing C-13 and C-16 and is inclusive of monitoring at the pump station site.

Q36. Dwg I-610 depicts a Personal Computer.
1a: The specification calls for a laptop. Is this the same item?
1b: Is this PC only responsible for the PLC and OIT programming tools?
1c: If not, what other functions is it responsible for?

A36. 1a:Yes
1b: Yes
1c: Additional coordination with City OPS staff maybe required.

Q37. Dwg I-610 shows Ethernet connections to the power monitors for each of the 6 pumps.
2a: What information is required from these units?

A37. 2a: See sequence of operation on I-601 and I-604, I-605 and I-606 for monitoring requirements for each pump.

Q38. Dwg I-610 show a weather station.
3a: What information is required from this unit?

A38. 3a: Local weather conditions

Q39. Dwg I-610 shows a single radio link to MOC II. Spec section 16900.2.2.B identifies a requirement for an alternate communications system.
4a: What is the medium for the alternate communications and how should the switchover be managed?

A39. 4a: Coordination with City OPS staff will be required during system procurement.

Q40. Dwg I-603 indicates two sample points (suction and discharge) each for the PI on each pump PI_100, PI_200, PI_300, PI_400, PI_500 & PI_600.
5a: Are there 2 Pressure Connections for each pump?

A40. 5a: Yes.

Q41. Dwgs I-604, 605 & 606 show the IO for the pumps.
6a: There is no point for speed indication or speed command for the three VFDs.
6b: Is this a complete list of points for the pumps?

A41. 6a: See Sequence of Operation on I-603, with requirements for pump speed for pumps 4, 5 & 6.
6b. See Sequence of Operation on I-603.

Q42. Specification Section 16700 1.1.A.2 indications the City is responsible for all programming of the HMI.
7a: Is this the MOC SCADA system?
7b: Is this the local operator interface computer?

A42. 7a: Yes.
7b: City staff will program the local operator interface HMI.

C. ADDENDUM

1. To Addendum A, Section C, Attachments, Item 2, Page 7, and Pages 10 through 36, **DELETE** in their entirety and **SUBSTITUTE** with Pages 20 through 46 of this Addendum.

D. NOTICE INVITING BIDS

1. To Section 3, Estimated Construction Cost, Page 5, **DELETE** in its entirety and **SUBSTITUTE** with the following:

   3. ESTIMATED CONSTRUCTION COST: The City's estimated construction cost for this project is **$11,011,000.**

E. ATTACHMENTS

1. To Attachment A, Scope of Work, Section 2, Estimated Construction Cost, Page 22, **DELETE** in its entirety and **SUBSTITUTE** with the following:

   2. ESTIMATED CONSTRUCTION COSTS: The City's estimated construction cost for this project is **$11,011,000.**

F. SUPPLEMENTARY SPECIAL PROVISIONS

1. To Attachment E, **ADD** the following:

SECTION 217 – BEDDING AND BACKFILL MATERIALS

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

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 subgrade 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.
Trench Zone	From 12" (300 mm) below pavement subgrade 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 901 – INSTALLATION AND CONNECTION

901-2.5 Payment. To the City Supplement, item 3, DELETE in its entirety and SUBSTITUTE with the following:

3. Traffic control, saw cutting the trench area, trench caps, and other spot repairs in the vicinity of the disturbed area at each restored connection shall be included in the square foot Bid item for "Pavement Restoration for Final Connection". Asphalt overlay and slurry seal Work shall be paid for under separate Bid items.

2. To Attachment E, Section 7, Responsibilities of the Contractor, Subsection 7-3.2, Types of insurance, Page 97, **ADD** the following:

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.

3. To Attachment E, Section 7, Responsibilities of the Contractor, Subsection 7-3.5, Policy Endorsements, Page 99, **ADD** the following:

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.

3. To Attachment E, Section 703, Encountering or Releasing Hazardous Substances, Subsection 703-20, Payment, Page 122, Item 1, **ADD** the following:

   o) Payment for Asbestos and Lead Abatement shall be included in the Bid Items "Lead Abatement, Disposal of Lead, Asbestos Abatement, Disposal of Asbestos".

G. ATTACHMENTS

1. To Attachment E, Supplementary Special Provisions Appendices, **ADD** "Appendix N, Asbestos Abatement Specification" and "Appendix O, Lead Containing Materials Abatement Specification", Pages 47 through 93 of this Addendum.

H. PLANS

1. To Drawing number 38929-85-D (S-11), **DELETE** "Keynote 1, L4x4x1 / 4 WITH 5/8" Anchor Bolts @ 16" OC" and "Keynote 3, W8x15", in their entirety.

2. To Drawing numbers 38929-01-D, 38929-15-D, 38929-16-D, 38929-27-D, 38929-30-D, 38929-31-D, 38929-109-D, 38929-112-D, 38929-114-D, 38929-118-D, 38929-119-D, **DELETE** in their entirety and **REPLACE** with Pages 94 of 104 of this Addendum.

I. ADDITIONAL CHANGES

For clarity where applicable, **ADDITIONS**, if any, have been **Underlined** and **DELETIONS**, if any, have been ~~**Stricken out**~~

1. The following are changes in the **Line Items Tab** in **PlanetBids**:

	Item Code	Item Description	UOM	QTY	Reference
Main Bid	238990	Lead Abatement	LS	1	703-20
Main Bid	238990	Disposal of Lead	LS	1	703-20
Main Bid	238990	Asbestos Abatement	LS	1	703-20
Main Bid	238990	Disposal of Asbestos	LS	1	703-20

James Nagelvoort, Director
Public Works Department

Dated: *November 23, 2016*
San Diego, California

JN/AJ/egz

9. WAGE RATES: This contract shall be subject to the following Davis-Bacon Wage Decisions:

General Decision Number: CA160001 11/11/2016 CA1

Superseded General Decision Number: CA20150001

State: California

Construction Types: Building, Heavy (Heavy and Dredging), Highway and Residential

County: San Diego County in California.

BUILDING CONSTRUCTION PROJECTS; DREDGING PROJECTS (does not include hopper dredge work); HEAVY CONSTRUCTION PROJECTS (does not include water well drilling); HIGHWAY CONSTRUCTION PROJECTS; RESIDENTIAL CONSTRUCTION PROJECTS (consisting of single family homes and apartments up to and including 4 stories)

Note: Under Executive Order (EO) 13658, an hourly minimum wage of $10.15 for calendar year 2016 applies to all contracts subject to the Davis-Bacon Act for which the solicitation was issued on or after January 1, 2015. If this contract is covered by the EO, the contractor must pay all workers in any classification listed on this wage determination at least $10.15 (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract in calendar year 2016. The EO minimum wage rate will be adjusted annually. Additional information on contractor requirements and worker protections under the EO is available at www.dol.gov/whd/govcontracts.

Modification Number	Publication Date
0	01/08/2016
1	02/12/2016
2	02/19/2016
3	02/26/2016
4	03/04/2016
5	03/18/2016
6	07/01/2016
7	07/08/2016
8	07/22/2016
9	08/12/2016
10	08/26/2016
11	09/16/2016
12	10/21/2016
13	11/11/2016

ASBE0005-002 07/04/2016

	Rates	Fringes
Asbestos Workers/Insulator (Includes the application of all insulating materials, protective coverings, coatings, and finishes to all types of mechanical systems)	$ 38.37	20.13
Fire Stop Technician (Application of Firestopping Materials for wall openings and penetrations in walls, floors, ceilings and curtain walls)	$ 26.15	17.31

ASBE0005-004 07/04/2016

	Rates	Fringes
Asbestos Removal worker/hazardous material handler (Includes preparation, wetting, stripping, removal, scrapping, vacuuming, bagging and disposing of all insulation materials from mechanical systems, whether they contain asbestos or not)	$ 18.38	10.82

BOIL0092-003 10/01/2012

	Rates	Fringes
BOILERMAKER	$ 41.17	28.27

BRCA0004-008 11/01/2015

	Rates	Fringes
BRICKLAYER; MARBLE SETTER	$ 34.44	17.21

BRCA0018-004 06/01/2016

	Rates	Fringes
MARBLE FINISHER	$ 28.45	11.38
TILE FINISHER	$ 24.53	4.19
TILE LAYER	$ 35.89	8.55

BRCA0018-010 09/01/2013

	Rates	Fringes
TERRAZZO FINISHER	$ 26.59	10.34

TERRAZZO WORKER/SETTER	$ 33.63	11.13

CARP0409-002 07/01/2008

	Rates	Fringes
Diver		
(1) Wet	$ 663.68	9.82
(2) Standby	$ 331.84	9.82
(3) Tender	$ 323.84	9.82
(4) Assistant Tender	$ 299.84	9.82

Amounts in "Rates' column are per day

CARP0409-008 08/01/2010

	Rates	Fringes
Modular Furniture Installer	$ 17.00	7.41

CARP0547-001 07/01/2009

	Rates	Fringes
CARPENTER		
(1) Bridge	$ 37.28	10.58
(2) Commercial Building	$ 32.30	10.58
(3) Heavy & Highway	$ 37.15	10.58
(4) Residential Carpenter	$ 25.84	10.58
(5) Residential Insulation Installer	$ 18.00	8.16
MILLWRIGHT	$ 37.65	10.58
PILEDRIVERMAN	$ 37.28	10.58

CARP0547-002 07/01/2009

	Rates	Fringes
Drywall		
(1) Work on wood framed construction of single family residences, apartments or condominiums under four stories		
Drywall Installer/Lather	$ 21.00	8.58
Drywall Stocker/Scrapper	$ 11.00	6.67
(2) All other work		
Drywall Installer/Lather	$ 27.35	9.58
Drywall Stocker/Scrapper	$ 11.00	6.67

ELEC0569-001 08/31/2015

	Rates	Fringes
Electricians (Tunnel Work)		
Cable Splicer	$ 46.88	13.54
Electrician	$ 46.13	13.51

Electricians: (All Other
Work, Including 4 Stories
Residential)
Cable Splicer.....$ 41.75 13.38
Electrician.....$ 41.00 13.36

ELEC0569-004 06/01/2015

	Rates	Fringes
ELECTRICIAN (Sound & Communications Sound Technician).....	$ 29.55	11.92

SOUND TECHNICIAN: Terminating, operating and performing final check-out

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ELEC0569-005 06/06/2016

	Rates	Fringes
Sound & Communications		
Sound Technician.....	$ 30.22	12.21

SOUND TECHNICIAN: Terminating, operating and performing final check-out

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ELEC0569-006 10/05/2015

Work on street lighting; traffic signals; and underground systems and/or established easements outside of buildings

	Rates	Fringes
Traffic signal, street light and underground work		
Utility Technician #1.....	$ 29.50	8.31
Utility Technician #2.....	$ 24.65	8.16

STREET LIGHT & TRAFFIC SIGNAL WORK:

UTILITY TECHNICIAN #1: Installation of street lights and traffic signals, including electrical circuitry, programmable controller, pedestal-mounted electrical meter enclosures and laying of pre-assembled cable in ducts. The layout of electrical systems and communication installation including proper position of trench depths, and radius at duct banks, location for manholes, street lights and traffic signals.

UTILITY TECHNICIAN #2: Distribution of material at jobsite, installation of underground ducts for electrical, telephone, cable TV land communication systems. The setting, leveling, grounding and racking of precast manholes, handholes and transformer pads.

ELEC0569-008 06/06/2016

	Rates	Fringes
ELECTRICIAN (Residential, 1-3 Stories)	$ 31.69	3%+6.61

ELEC1245-001 06/01/2015

	Rates	Fringes
LINE CONSTRUCTION		
(1) Lineman; Cable splicer	$ 52.85	15.53
(2) Equipment specialist (operates crawler tractors, commercial motor vehicles, backhoes, trenchers, cranes (50 tons and below), overhead & underground distribution line equipment)	$ 42.21	14.32
(3) Groundman	$ 32.28	14.03
(4) Powderman	$ 47.19	14.60

HOLIDAYS: New Year's Day, M.L. King Day, Memorial Day, Independence Day, Labor Day, Veterans Day, Thanksgiving Day and day after Thanksgiving, Christmas Day

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ELEV0018-001 01/01/2015

	Rates	Fringes
ELEVATOR MECHANIC	$ 49.90	28.38

FOOTNOTE:
PAID VACATION: Employer contributes 8% of regular hourly rate as vacation pay credit for employees with more than 5 years of service, and 6% for 6 months to 5 years of service.
PAID HOLIDAYS: New Years Day, Memorial Day, Independence Day, Labor Day, Veterans Day, Thanksgiving Day, Friday after Thanksgiving, and Christmas Day.

ENGI0012-003 07/01/2016

	Rates	Fringes
OPERATOR: Power Equipment (All Other Work)		
GROUP 1	$ 39.95	23.35
GROUP 2	$ 40.73	23.35
GROUP 3	$ 41.02	23.35
GROUP 4	$ 42.51	23.35
GROUP 5	$ 41.86	23.35
GROUP 6	$ 41.83	23.35
GROUP 8	$ 42.84	23.35

GROUP 9	$ 42.19	23.35
GROUP 10	$ 42.96	23.35
GROUP 11	$ 42.31	23.35
GROUP 12	$ 43.13	23.35
GROUP 13	$ 43.23	23.35
GROUP 14	$ 43.26	23.35
GROUP 15	$ 43.34	23.35
GROUP 16	$ 43.46	23.35
GROUP 17	$ 43.63	23.35
GROUP 18	$ 43.73	23.35
GROUP 19	$ 43.84	23.35
GROUP 20	$ 43.96	23.35
GROUP 21	$ 44.13	23.35
GROUP 22	$ 44.23	23.35
GROUP 23	$ 44.34	23.35
GROUP 24	$ 44.46	23.35
GROUP 25	$ 44.63	23.35
OPERATOR: Power Equipment (Cranes, Piledriving & Hoisting)		
GROUP 1	$ 43.20	22.15
GROUP 2	$ 43.98	22.15
GROUP 3	$ 44.27	22.15
GROUP 4	$ 44.41	22.15
GROUP 5	$ 44.63	22.15
GROUP 6	$ 44.74	22.15
GROUP 7	$ 44.86	22.15
GROUP 8	$ 45.03	22.15
GROUP 9	$ 45.20	22.15
GROUP 10	$ 46.20	22.15
GROUP 11	$ 47.20	22.15
GROUP 12	$ 48.20	22.15
GROUP 13	$ 49.20	22.15
OPERATOR: Power Equipment (Tunnel Work)		
GROUP 1	$ 41.80	23.35
GROUP 2	$ 42.58	23.35
GROUP 3	$ 42.87	23.35
GROUP 4	$ 43.01	23.35
GROUP 5	$ 43.23	23.35
GROUP 6	$ 43.34	23.35
GROUP 7	$ 43.46	23.35

PREMIUM PAY:

$3.75 per hour shall be paid on all Power Equipment Operator work on the followng Military Bases: China Lake Naval Reserve, Vandenberg AFB, Point Arguello, Seely Naval Base, Fort Irwin, Nebo Annex Marine Base, Marine Corp Logistics Base Yermo, Edwards AFB, 29 Palms Marine Base and Camp Pendleton

Workers required to suit up and work in a hazardous material environment: $2.00 per hour additional. Combination mixer and compressor operator on gunite work shall be classified as a concrete mobile mixer operator.

SEE ZONE DEFINITIONS AFTER CLASSIFICATIONS

POWER EQUIPMENT OPERATORS CLASSIFICATIONS

GROUP 1: Bargeman; Brakeman; Compressor operator; Ditch Witch, with seat or similar type equipment; Elevator operator-inside; Engineer Oiler; Forklift operator (includes loed, lull or similar types under 5 tons; Generator operator; Generator, pump or compressor plant operator; Pump operator; Signalman; Switchman

GROUP 2: Asphalt-rubber plant operator (nurse tank operator); Concrete mixer operator-skip type; Conveyor operator; Fireman; Forklift operator (includes loed, lull or similar types over 5 tons; Hydrostatic pump operator; oiler crusher (asphalt or concrete plant); Petromat laydown machine; PJU side dum jack; Screening and conveyor machine operator (or similar types); Skiploader (wheel type up to 3/4 yd. without attachment); Tar pot fireman; Temporary heating plant operator; Trenching machine oiler

GROUP 3: Asphalt-rubber blend operator; Bobcat or similar type (Skid steer); Equipment greaser (rack); Ford Ferguson (with dragtype attachments); Helicopter radioman (ground); Stationary pipe wrapping and cleaning machine operator

GROUP 4: Asphalt plant fireman; Backhoe operator (mini-max or similar type); Boring machine operator; Boxman or mixerman (asphalt or concrete); Chip spreading machine operator; Concrete cleaning decontamination machine operator; Concrete Pump Operator (small portable); Drilling machine operator, small auger types (Texoma super economatic or similar types - Hughes 100 or 200 or similar types - drilling depth of 30' maximum); Equipment greaser (grease truck); Guard rail post driver operator; Highline cableway signalman; Hydra-hammer-aero stomper; Micro Tunneling (above ground tunnel); Power concrete curing machine operator; Power concrete saw operator; Power-driven jumbo form setter operator; Power sweeper operator; Rock Wheel Saw/Trencher; Roller operator (compacting); Screed operator (asphalt or concrete); Trenching machine operator (up to 6 ft.); Vacuum or much truck

GROUP 5: Equipment Greaser (Grease Truck/Multi Shift).

GROUP 6: Articulating material hauler; Asphalt plant engineer; Batch plant operator; Bit sharpener; Concrete joint machine operator (canal and similar type); Concrete planer operator; Dandy digger; Deck engine operator; Derrickman (oilfield type); Drilling machine operator, bucket or auger types (Calweld 100 bucket or similar types - Watson 1000 auger or similar types - Texoma 330, 500 or 600 auger or similar types - drilling depth of 45' maximum); Drilling machine operator; Hydrographic seeder machine operator (straw, pulp or seed), Jackson track maintainer, or similar type; Kalamazoo Switch tamper, or similar type; Machine tool operator; Maginnis internal full slab vibrator, Mechanical berm, curb or gutter(concrete or asphalt); Mechanical finisher operator (concrete,

Clary-Johnson-Bidwell or similar); Micro tunnel system (below ground); Pavement breaker operator (truck mounted); Road oil mixing machine operator; Roller operator (asphalt or finish), rubber-tired earth moving equipment (single engine, up to and including 25 yds. struck); Self-propelled tar pipelining machine operator; Skiploader operator (crawler and wheel type, over 3/4 yd. and up to and including 1-1/2 yds.); Slip form pump operator (power driven hydraulic lifting device for concrete forms); Tractor operator-bulldozer, tamper-scraper (single engine, up to 100 h.p. flywheel and similar types, up to and including D-5 and similar types); Tugger hoist operator (1 drum); Ultra high pressure waterjet cutting tool system operator; Vacuum blasting machine operator

GROUP 8: Asphalt or concrete spreading operator (tamping or finishing); Asphalt paving machine operator (Barber Greene or similar type); Asphalt-rubber distribution operator; Backhoe operator (up to and including 3/4 yd.), small ford, Case or similar; Cast-in-place pipe laying machine operator; Combination mixer and compressor operator (gunite work); Compactor operator (self-propelled); Concrete mixer operator (paving); Crushing plant operator; Drill Doctor; Drilling machine operator, Bucket or auger types (Calweld 150 bucket or similar types - Watson 1500, 2000 2500 auger or similar types - Texoma 700, 800 auger or similar types - drilling depth of 60' maximum); Elevating grader operator; Grade checker; Gradall operator; Grouting machine operator; Heavy-duty repairman; Heavy equipment robotics operator; Kalamazoo balliste regulator or similar type; Kolman belt loader and similar type; Le Tourneau blob compactor or similar type; Loader operator (Athey, Euclid, Sierra and similar types); Mobark Chipper or similar; Ozzie padder or similar types; P.C. slot saw; Pneumatic concrete placing machine operator (Hackley-Presswell or similar type); Pumpcrete gun operator; Rock Drill or similar types; Rotary drill operator (excluding caisson type); Rubber-tired earth-moving equipment operator (single engine, caterpillar, Euclid, Athey Wagon and similar types with any and all attachments over 25 yds. up to and including 50 cu. yds. struck); Rubber-tired earth-moving equipment operator (multiple engine up to and including 25 yds. struck); Rubber-tired scraper operator (self-loading paddle wheel type-John Deere, 1040 and similar single unit); Self-propelled curb and gutter machine operator; Shuttle buggy; Skiploader operator (crawler and wheel type over 1-1/2 yds. up to and including 6-1/2 yds.); Soil remediation plant operator; Surface heaters and planer operator; Tractor compressor drill combination operator; Tractor operator (any type larger than D-5 - 100 flywheel h.p. and over, or similar-bulldozer, tamper, scraper and push tractor single engine); Tractor operator (boom attachments), Traveling pipe wrapping, cleaning and bendng machine operator; Trenching machine operator (over 6 ft. depth capacity, manufacturer's rating); trenching Machine with Road Miner attachment (over 6 ft depth capacity): Ultra high pressure waterjet cutting tool system mechanic; Water pull

(compaction) operator

GROUP 9: Heavy Duty Repairman

GROUP 10: Drilling machine operator, Bucket or auger types (Calweld 200 B bucket or similar types-Watson 3000 or 5000 auger or similar types-Texoma 900 auger or similar types-drilling depth of 105' maximum); Dual drum mixer, dynamic compactor LDC350 (or similar types); Monorail locomotive operator (diesel, gas or electric); Motor patrol-blade operator (single engine); Multiple engine tractor operator (Euclid and similar type-except Quad 9 cat.); Rubber-tired earth-moving equipment operator (single engine, over 50 yds. struck); Pneumatic pipe ramming tool and similar types; Prestressed wrapping machine operator; Rubber-tired earth-moving equipment operator (single engine, over 50 yds. struck); Rubber tired earth moving equipment operator (multiple engine, Euclid, caterpillar and similar over 25 yds. and up to 50 yds. struck), Tower crane repairman; Tractor loader operator (crawler and wheel type over 6-1/2 yds.); Woods mixer operator (and similar Pugmill equipment)

GROUP 11: Heavy Duty Repairman - Welder Combination, Welder - Certified.

GROUP 12: Auto grader operator; Automatic slip form operator; Drilling machine operator, bucket or auger types (Calweld, auger 200 CA or similar types - Watson, auger 6000 or similar types - Hughes Super Duty, auger 200 or similar types - drilling depth of 175' maximum); Hoe ram or similar with compressor; Mass excavator operator less tha 750 cu. yards; Mechanical finishing machine operator; Mobile form traveler operator; Motor patrol operator (multi-engine); Pipe mobile machine operator; Rubber-tired earth- moving equipment operator (multiple engine, Euclid, Caterpillar and similar type, over 50 cu. yds. struck); Rubber-tired self- loading scraper operator (paddle-wheel-auger type self-loading - two (2) or more units)

GROUP 13: Rubber-tired earth-moving equipment operator operating equipment with push-pull system (single engine, up to and including 25 yds. struck)

GROUP 14: Canal liner operator; Canal trimmer operator; Remote- control earth-moving equipment operator (operating a second piece of equipment: $1.00 per hour additional); Wheel excavator operator (over 750 cu. yds.)

GROUP 15: Rubber-tired earth-moving equipment operator, operating equipment with push-pull system (single engine, Caterpillar, Euclid, Athey Wagon and similar types with any and all attachments over 25 yds. and up to and including 50 yds. struck); Rubber-tired earth-moving equipment operator, operating equipment with push-pull system (multiple engine-up to and including 25 yds. struck)

GROUP 16: Rubber-tired earth-moving equipment operator, operating equipment with push-pull system (single engine, over 50 yds. struck); Rubber-tired earth-moving equipment operator, operating equipment with push-pull system (multiple engine, Euclid, Caterpillar and similar, over 25 yds. and up to 50 yds. struck)

GROUP 17: Rubber-tired earth-moving equipment operator, operating equipment with push-pull system (multiple engine, Euclid, Caterpillar and similar, over 50 cu. yds. struck); Tandem tractor operator (operating crawler type tractors in tandem - Quad 9 and similar type)

GROUP 18: Rubber-tired earth-moving equipment operator, operating in tandem (scrapers, belly dumps and similar types in any combination, excluding compaction units - single engine, up to and including 25 yds. struck)

GROUP 19: Rotex concrete belt operator (or similar types); Rubber-tired earth-moving equipment operator, operating in tandem (scrapers, belly dumps and similar types in any combination, excluding compaction units - single engine, Caterpillar, Euclid, Athey Wagon and similar types with any and all attachments over 25 yds.and up to and including 50 cu. yds. struck); Rubber-tired earth-moving equipment operator, operating in tandem (scrapers, belly dumps and similar types in any combination, excluding compaction units - multiple engine, up to and including 25 yds. struck)

GROUP 20: Rubber-tired earth-moving equipment operator, operating in tandem (scrapers, belly dumps and similar types in any combination, excluding compaction units - single engine, over 50 yds. struck); Rubber-tired earth-moving equipment operator, operating in tandem (scrapers, belly dumps, and similar types in any combination, excluding compaction units - multiple engine, Euclid, Caterpillar and similar, over 25 yds. and up to 50 yds. struck)

GROUP 21: Rubber-tired earth-moving equipment operator, operating in tandem (scrapers, belly dumps and similar types in any combination, excluding compaction units - multiple engine, Euclid, Caterpillar and similar type, over 50 cu. yds. struck)

GROUP 22: Rubber-tired earth-moving equipment operator, operating equipment with the tandem push-pull system (single engine, up to and including 25 yds. struck)

GROUP 23: Rubber-tired earth-moving equipment operator, operating equipment with the tandem push-pull system (single engine, Caterpillar, Euclid, Athey Wagon and similar types with any and all attachments over 25 yds. and up to and including 50 yds. struck); Rubber-tired earth-moving equipment operator, operating with the tandem push-pull system (multiple engine, up to and including 25 yds. struck)

GROUP 24: Rubber-tired earth-moving equipment operator, operating equipment with the tandem push-pull system (single engine, over 50 yds. struck); Rubber-tired earth-moving equipment operator, operating equipment with the tandem push-pull system (multiple engine, Euclid, Caterpillar and similar, over 25 yds. and up to 50 yds. struck)

GROUP 25: Concrete pump operator-truck mounted; Rubber-tired earth-moving equipment operator, operating equipment with the tandem push-pull system (multiple engine, Euclid, Caterpillar and similar type, over 50 cu. yds. struck)

CRANES, PILEDRIVING AND HOISTING EQUIPMENT CLASSIFICATIONS

GROUP 1: Engineer oiler; Fork lift operator (includes loed, lull or similar types)

GROUP 2: Truck crane oiler

GROUP 3: A-frame or winch truck operator; Ross carrier operator (jobsite)

GROUP 4: Bridge-type unloader and turntable operator; Helicopter hoist operator

GROUP 5: Hydraulic boom truck; Stinger crane (Austin-Western or similar type); Tugger hoist operator (1 drum)

GROUP 6: Bridge crane operator; Cretor crane operator; Hoist operator (Chicago boom and similar type); Lift mobile operator; Lift slab machine operator (Vagtborg and similar types); Material hoist and/or manlift operator; Polar gantry crane operator; Self Climbing scaffold (or similar type); Shovel, backhoe, dragline, clamshell operator (over 3/4 yd. and up to 5 cu. yds. mrc); Tugger hoist operator

GROUP 7: Pedestal crane operator; Shovel, backhoe, dragline, clamshell operator (over 5 cu. yds. mrc); Tower crane repair; Tugger hoist operator (3 drum)

GROUP 8: Crane operator (up to and including 25 ton capacity); Crawler transporter operator; Derrick barge operator (up to and including 25 ton capacity); Hoist operator, stiff legs, Guy derrick or similar type (up to and including 25 ton capacity); Shovel, backhoe, dragline, clamshell operator (over 7 cu. yds., M.R.C.)

GROUP 9: Crane operator (over 25 tons and up to and including 50 tons mrc); Derrick barge operator (over 25 tons up to and including 50 tons mrc); Highline cableway operator; Hoist operator, stiff legs, Guy derrick or similar type (over 25 tons up to and including 50 tons mrc); K-crane operator; Polar crane operator; Self erecting tower crane operator maximum lifting capacity ten tons

GROUP 10: Crane operator (over 50 tons and up to and

including 100 tons mrc); Derrick barge operator (over 50 tons up to and including 100 tons mrc); Hoist operator, stiff legs, Guy derrick or similar type (over 50 tons up to and including 100 tons mrc), Mobile tower crane operator (over 50 tons, up to and including 100 tons M.R.C.); Tower crane operator and tower gantry

GROUP 11: Crane operator (over 100 tons and up to and including 200 tons mrc); Derrick barge operator (over 100 tons up to and including 200 tons mrc); Hoist operator, stiff legs, Guy derrick or similar type (over 100 tons up to and including 200 tons mrc); Mobile tower crane operator (over 100 tons up to and including 200 tons mrc)

GROUP 12: Crane operator (over 200 tons up to and including 300 tons mrc); Derrick barge operator (over 200 tons up to and including 300 tons mrc); Hoist operator, stiff legs, Guy derrick or similar type (over 200 tons, up to and including 300 tons mrc); Mobile tower crane operator (over 200 tons, up to and including 300 tons mrc)

GROUP 13: Crane operator (over 300 tons); Derrick barge operator (over 300 tons); Helicopter pilot; Hoist operator, stiff legs, Guy derrick or similar type (over 300 tons); Mobile tower crane operator (over 300 tons)

TUNNEL CLASSIFICATIONS

GROUP 1: Skiploader (wheel type up to 3/4 yd. without attachment)

GROUP 2: Power-driven jumbo form setter operator

GROUP 3: Dinkey locomotive or motorperson (up to and including 10 tons)

GROUP 4: Bit sharpener; Equipment greaser (grease truck); Slip form pump operator (power-driven hydraulic lifting device for concrete forms); Tugger hoist operator (1 drum); Tunnel locomotive operator (over 10 and up to and including 30 tons)

GROUP 5: Backhoe operator (up to and including 3/4 yd.); Small Ford, Case or similar; Drill doctor; Grouting machine operator; Heading shield operator; Heavy-duty repairperson; Loader operator (Athey, Euclid, Sierra and similar types); Mucking machine operator (1/4 yd., rubber-tired, rail or track type); Pneumatic concrete placing machine operator (Hackley-Presswell or similar type); Pneumatic heading shield (tunnel); Pumpcrete gun operator; Tractor compressor drill combination operator; Tugger hoist operator (2 drum); Tunnel locomotive operator (over 30 tons)

GROUP 6: Heavy Duty Repairman

GROUP 7: Tunnel mole boring machine operator

ENGINEERS ZONES

$1.00 additional per hour for all of IMPERIAL County and the portions of KERN, RIVERSIDE & SAN BERNARDINO Counties as defined below:

That area within the following Boundary: Begin in San Bernardino County, approximately 3 miles NE of the intersection of I-15 and the California State line at that point which is the NW corner of Section 1, T17N,m R14E, San Bernardino Meridian. Continue W in a straight line to that point which is the SW corner of the northwest quarter of Section 6, T27S, R42E, Mt. Diablo Meridian. Continue North to the intersection with the Inyo County Boundary at that point which is the NE corner of the western half of the northern quarter of Section 6, T25S, R42E, MDM. Continue W along the Inyo and San Bernardino County boundary until the intersection with Kern County, as that point which is the SE corner of Section 34, T24S, R40E, MDM. Continue W along the Inyo and Kern County boundary until the intersection with Tulare County, at that point which is the SW corner of the SE quarter of Section 32, T24S, R37E, MDM. Continue W along the Kern and Tulare County boundary, until that point which is the NW corner of T25S, R32E, MDM. Continue S following R32E lines to the NW corner of T31S, R32E, MDM. Continue W to the NW corner of T31S, R31E, MDM. Continue S to the SW corner of T32S, R31E, MDM. Continue W to SW corner of SE quarter of Section 34, T32S, R30E, MDM. Continue S to SW corner of T11N, R17W, SBM. Continue E along south boundary of T11N, SBM to SW corner of T11N, R7W, SBM. Continue S to SW corner of T9N, R7W, SBM. Continue E along south boundary of T9N, SBM to SW corner of T9N, R1E, SBM. Continue S along west boundary of R1E, SMB to Riverside County line at the SW corner of T1S, R1E, SBM. Continue E along south boundary of T1s, SBM (Riverside County Line) to SW corner of T1S, R10E, SBM. Continue S along west boundary of R10E, SBM to Imperial County line at the SW corner of T8S, R10E, SBM. Continue W along Imperial and Riverside county line to NW corner of T9S, R9E, SBM. Continue S along the boundary between Imperial and San Diego Counties, along the west edge of R9E, SBM to the south boundary of Imperial County/California state line. Follow the California state line west to Arizona state line, then north to Nevada state line, then continuing NW back to start at the point which is the NW corner of Section 1, T17N, R14E, SBM

$1.00 additional per hour for portions of SAN LUIS OBISPO, KERN, SANTA BARBARA & VENTURA as defined below:

That area within the following Boundary: Begin approximately 5 miles north of the community of Cholame, on the Monterey County and San Luis Obispo County boundary at the NW corner of T25S, R16E, Mt. Diablo Meridian. Continue south along the west side of R16E to the SW corner of T30S, R16E, MDM. Continue E to SW corner of T30S, R17E, MDM. Continue S to SW corner of T31S, R17E, MDM. Continue E to SW corner of T31S, R18E, MDM. Continue S along West side of R18E, MDM as it crosses into San Bernardino Meridian numbering area and becomes R30W. Follow

the west side of R30W, SBM to the SW corner of T9N, R30W, SBM. Continue E along the south edge of T9N, SBM to the Santa Barbara County and Ventura County boundary at that point whch is the SW corner of Section 34.T9N, R24W, SBM, continue S along the Ventura County line to that point which is the SW corner of the SE quarter of Section 32, T7N, R24W, SBM. Continue E along the south edge of T7N, SBM to the SE corner to T7N, R21W, SBM. Continue N along East side of R21W, SBM to Ventura County and Kern County boundary at the NE corner of T8N, R21W. Continue W along the Ventura County and Kern County boundary to the SE corner of T9N, R21W. Continue North along the East edge of R21W, SBM to the NE corner of T12N, R21W, SBM. Continue West along the north edge of T12N, SBM to the SE corner of T32S, R21E, MDM. [T12N SBM is a think strip between T11N SBM and T32S MDM]. Continue North along the East side of R21E, MDM to the Kings County and Kern County border at the NE corner of T25S, R21E, MDM, continue West along the Kings County and Kern County Boundary until the intersection of San Luis Obispo County. Continue west along the Kings County and San Luis Obispo County boundary until the intersection with Monterey County. Continue West along the Monterey County and San Luis Obispo County boundary to the beginning point at the NW corner of T25S, R16E, MDM.

$2.00 additional per hour for INYO and MONO Counties and the Northern portion of SAN BERNARDINO County as defined below:

That area within the following Boundary: Begin at the intersection of the northern boundary of Mono County and the California state line at the point which is the center of Section 17, T10N, R22E, Mt. Diablo Meridian. Continue S then SE along the entire western boundary of Mono County, until it reaches Inyo County at the point which is the NE corner of the Western half of the NW quarter of Section 2, T8S, R29E, MDM. Continue SSE along the entire western boundary of Inyo County, until the intersection with Kern County at the point which is the SW corner of the SE 1/4 of Section 32, T24S, R37E, MDM. Continue E along the Inyo and Kern County boundary until the intersection with San Bernardino County at that point which is the SE corner of section 34, T24S, R40E, MDM. Continue E along the Inyo and San Bernardino County boundary until the point which is the NE corner of the Western half of the NW quarter of Section 6, T25S, R42E, MDM. Continue S to that point which is the SW corner of the NW quarter of Section 6, T27S, R42E, MDM. Continue E in a straight line to the California and Nevada state border at the point which is the NW corner of Section 1, T17N, R14E, San Bernardino Meridian. Then continue NW along the state line to the starting point, which is the center of Section 18, T10N, R22E, MDM.

REMAINING AREA NOT DEFINED ABOVE RECIEVES BASE RATE

ENGI0012-004 08/01/2015

	Rates	Fringes

OPERATOR: Power Equipment
(DREDGING)

(1) Leverman	$ 49.50	23.60
(2) Dredge dozer	$ 43.53	23.60
(3) Deckmate	$ 43.42	23.60
(4) Winch operator (stern winch on dredge)	$ 42.87	23.60
(5) Fireman-Oiler, Deckhand, Bargeman, Leveehand	$ 42.33	23.60
(6) Barge Mate	$ 42.94	23.60

IRON0377-002 07/01/2016

	Rates	Fringes
Ironworkers:		
Fence Erector	$ 28.33	20.64
Ornamental, Reinforcing and Structural	$ 34.75	29.20

PREMIUM PAY:

$6.00 additional per hour at the following locations:

China Lake Naval Test Station, Chocolate Mountains Naval Reserve-Niland,
Edwards AFB, Fort Irwin Military Station, Fort Irwin Training Center-Goldstone, San Clemente Island, San Nicholas Island, Susanville Federal Prison, 29 Palms - Marine Corps, U.S. Marine Base - Barstow, U.S. Naval Air Facility - Sealey, Vandenberg AFB

$4.00 additional per hour at the following locations:

Army Defense Language Institute - Monterey, Fallon Air Base, Naval Post Graduate School - Monterey, Yermo Marine Corps Logistics Center

$2.00 additional per hour at the following locations:

Port Hueneme, Port Mugu, U.S. Coast Guard Station - Two Rock

LABO0089-001 07/18/2016

	Rates	Fringes
LABORER (BUILDING and all other Residential Construction)		
Group 1	$ 29.42	19.78
Group 2	$ 30.10	19.78
Group 3	$ 30.81	19.78
Group 4	$ 31.61	19.78
Group 5	$ 33.54	19.78
LABORER (RESIDENTIAL CONSTRUCTION - See definition		

below)

(1) Laborer.....	$ 27.32	18.11
(2) Cleanup, Landscape, Fencing (Chain Link & Wood).	$ 26.03	18.11

RESIDENTIAL DEFINITION: Wood or metal frame construction of single family residences, apartments and condominums - excluding (a) projects that exceed three stories over a garage level, (b) any utility work such as telephone, gas, water, sewer and other utilities and (c) any fine grading work, utility work or paving work in the future street and public right-of-way; but including all rough grading work at the job site behind the existing right of way

LABORER CLASSIFICATIONS

GROUP 1: Cleaning and handling of panel forms; Concrete Screeding for Rought Strike-off; Concrete, water curing; Demolition laborer; Flagman; Gas, oil and/or water pipeline laborer; General Laborer; General clean-up laborer; Landscape laborer; Jetting laborer; Temporary water and air lines laborer; Material hoseman (walls, slabs, floors and decks); Plugging, filling of Shee-bolt holes; Dry packing of concrete; Railroad maintenance, Repair Trackman and road beds, Streetcar and railroad construction trac laborers; Slip form raisers; Slurry seal crews (mixer operator, applicator operator, squeegee man, Shuttle man, top man), filling of cracks by any method on any surface; Tarman and mortar man; Tool crib or tool house laborer; Window cleaner; Wire Mesh puling-all concrete pouring operations

GROUP 2: Asphalt Shoveler; Cement Dumper (on 1 yard or larger mixer and handling bulk cement); Cesspool digger and installer; Chucktender; Chute man, pouring concrete, the handling of the cute from ready mix trucks, such as walls, slabs, decks, floors, foundations, footings, curbs, gutters and sidewalks; Concrete curer-impervious membrane and form oiler; Cutting torch operator (demoliton); Guinea chaser; Headboard man-asphlt; Laborer,
packing rod steel and pans; membrane vapor barrier installer; Power broom sweepers (small); Riiprap, stonepaver, placing stone or wet sacked concrete; Roto scraper and tiller; Tank sealer and cleaner; Tree climber, faller, chain saw operator, Pittsburgh Chipper and similar type brush shredders; Underground laborers, including caisson bellower

GROUP 3: Buggymobile; Concrete cutting torch; Concrete cutting torch; Concrete pile cutter; Driller, jackhammer, 2 1/2 feet drill steel or longer; Dri Pak-it machine; High sealer (including drilling of same); Hydro seeder and similar type; Impact wrench, mult-plate; Kettlemen, potmen and mean applying asphalt, lay-kold, creosote, line caustic and similar type materials (applying means applying, dipping, brushing or handling of such materials for pipe wrapping and waterproofing); Operators of pneumatic, gas, electric tools, vibratring machines, pavement breakers, air

blasting, come-along, and similar mechanical tools not separately classified herein; Pipelayers back up man coating, grouting, making of joints, sealing, caulking, diapering and inclduing rubber gasket joints, pointing and any and all other services; Rotary Scarifier or multiple head concrete chipping scaarifier; Steel header board man and guideline setter; Tampers, Barko, Wacker and similar type; Trenching machine, handpropelled

GROUP 4: Asphalt raker, luterman, ironer, apshalt dumpman and asphalt spreader boxes (all types); Concrete core cutter (walls, floors or ceilings), Grinder or sander; Concrete saw man; cutting walls or flat work, scoring old or new concrete; Cribber, shorer, lagging, sheeting and trench bracing, hand-guided lagging hammer; Laser beam in connection with laborer's work; Oversize concrete vibrator operator 70 pounds and over; Pipelayer performing all services in the laying, installation and all forms of connection of pipe from the point of receiving pipe in the ditch until completion of oepration, including any and all forms of tubular material, whether pipe, metallic or non-metallic, conduit, and any other stationary type of tubular device used for the conveying of any substance or element, whether water, sewage, solid, gas, air or other product whatsoever and without regard to the nature of material from which the tubular material is fabricated; No joint pipe and stripping of same; Prefabricated manhole installer; Sandblaster (nozzleman), Porta shot-blast, water blasting

GROUP 5: Blasters Powderman-All work of loading holes, placing and blasting of all pwder and explosives of whatever type, regardless of method used for such loading and placing; Driller-all power drills, excluding jackhammer, whether core, diamond, wagon, track, multiple unit, and any and all other types of mechanical drills without regard to the form of motive power.

LABO0089-002 11/01/2015

	Rates	Fringes
LABORER (MASON TENDER)	$ 29.12	15.39

LABO0089-004 07/03/2016

HEAVY AND HIGHWAY CONSTRUCTION

	Rates	Fringes
Laborers:		
Group 1	$ 30.54	19.73
Group 2	$ 31.00	19.73
Group 3	$ 31.41	19.73
Group 4	$ 32.25	19.73
Group 5	$ 36.37	19.73

LABORER CLASSIFICATIONS

GROUP 1: Laborer: General or Construction Laborer, Landscape Laborer. Asphalt Rubber Material Loader. Boring Machine Tender (outside), Carpenter Laborer (cleaning, handling, oiling & blowing of panel forms and lumber), Concrete Laborer, Concrete Screeding for rough strike-off, Concrete water curing. Concrete Curb & Gutter laborer, Certified Confined Space Laborer, Demolition laborer & Cleaning of Brick and lumber,Expansion Joint Caulking; Environmental Remediation, Monitoring Well, Toxic waste and Geotechnical Drill tender, Fine Grader, Fire Watcher, Limbers, Brush Loader, Pilers and Debris Handlers. flagman. Gas Oil and Water Pipeline Laborer. Material Hoseman (slabs, walls, floors, decks); Plugging, filling of shee bolt holes; Dry packing of concrete and patching; Post Holer Digger (manual); Railroad maintenance, repair trackman, road beds; Rigging & signaling; Scaler, Slip-Form Raisers, Filling cracks on any surface, tool Crib or Tool House Laborer, Traffic control (signs, barriers, barricades, delineator, cones etc.), Window Cleaner

GROUP 2: Asphalt abatement; Buggymobile; Cement dumper (on 1 yd. or larger mixers and handling bulk cement); Concrete curer, impervious membrane and form oiler; Chute man, pouring concrete; Concrete cutting torch; Concrete pile cutter; driller/Jackhammer, with drill steel 2 1/'2 feet or longer; Dry pak-it machine; Fence erector; Pipeline wrapper, gas, oil, water, pot tender & form man; Grout man; Installation of all asphalt overlay fabric and materials used for reinforcing asphalt; Irrigation laborer; Kettleman-Potman hot mop, includes applying asphalt, lay-klold, creosote, lime caustic and similar tyhpes of materials (dipping, brushing, handling) and waterproofing; Membrane vapor barrier installer; Pipelayer backup man (coating, grouting, making of joints, sealing caulkiing, diapering including rubber basket joints, pointing); Rotary scarifier, multiple head concrete chipper; Rock slinger; Roto scraper & tiller; Sandblaster pot tender; Septic tank digger/installer; Tamper/wacker operator; Tank scaler & cleaner; Tar man & mortar man; Tree climber/faller, chainb saw operator, Pittsburgh chipper & similar type brush shredders.

GROUP 3: Asphalt, installation of all frabrics; Buggy Mobile Man, Bushing hammer; Compactor (all types), Concrete Curer - Impervious membrane, Form Oiler, Concrete Cutting Torch, Concrete Pile Cutter,Driller/Jackhammer with drill steel 2 1/2 ft or longer, Dry Pak-it machine, Fence erector including manual post hole digging, Gas oil or water Pipeline Wrapper - 6 ft pipe and over, Guradrail erector, Hydro seeder, Impact Wrench man (multi plate), kettleman-Potman Hot Mop includes applying Asphalt, Lay-Kold, Creosote, lime caustic and similar types of materials (dipping, brushing or handling) and waterproofing. Laser Beam in connection with Laborer work.

High Scaler, Operators of Pneumatic Gas or Electric Tools, Vibrating Machines, Pavement Breakers, Air Blasting, Come-Alongs and similar mechanical tools, Remote-Controlled Robotic Tools in connection with Laborers work. Pipelayer Backup Man (Coating, grouting,m makeing of joints, sealing, caulking, diapering including rubber gasket joints, pointing and other services). Power Post Hole Digger, Rotary Scarifier (multiple head concrete chipper scarifier), Rock Slinger, Shot Blast equipment (8 to 48 inches), Steel Headerboard Man and Guideline Setter, Tamper/Wacker operator and similar types, Trenching Machine hand propelled.

GROUP 4: Any worker exposed to raw sewage. Asphalt Raker, Luteman, Asphalt Dumpman, Asphalt Spreader Boxes, Concrete Core Cutter, Concrete Saw Man, Cribber, Shorer, Head Rock Slinger. Installation of subsurface instrumentation, monitoring wells or points, remediation system installer; Laborer, asphalt-rubber distributor bootman; Oversize concrete vibrator operators, 70 pounds or over. Pipelayer, Prfefabricated Manhole Installer, Sandblast Nozzleman (Water Balsting-Porta Shot Blast), Traffic Lane Closure.

GROUP 5: Blasters Powderman-All work of loading holes, placing and blasting of all powder and explosives of whatever type, regardless of method used for such loading and placing; Horizontal directional driller, Boring system, Electronic traking, Driller: all power drills excluding jackhammer, whether core, diamond, wagon, track, multiple unit, and all other types of mechanical drills without regard to form of motive power. Environmental remediation, Monitoring well, Toxic waste and Geotechnical driller, Toxic waste removal. Welding in connection with Laborer's work.

LABO0300-005 01/01/2016

	Rates	Fringes
Asbestos Removal Laborer.....	$ 30.43	16.07

SCOPE OF WORK: Includes site mobilization, initial site cleanup, site preparation, removal of asbestos-containing material and toxic waste, encapsulation, enclosure and disposal of asbestos- containing materials and toxic waste by hand or with equipment or machinery; scaffolding, fabrication of temporary wooden barriers and assembly of decontamination stations.

LABO1184-001 07/04/2016

	Rates	Fringes
Laborers: (HORIZONTAL DIRECTIONAL DRILLING)		

(1) Drilling Crew Laborer...	$ 33.65	13.95
(2) Vehicle Operator/Hauler.	$ 33.82	13.95
(3) Horizontal Directional Drill Operator.....	$ 35.67	13.95
(4) Electronic Tracking Locator.....	$ 37.67	13.95
Laborers: (STRIPING/SLURRY SEAL)		
GROUP 1.....	$ 34.86	17.03
GROUP 2.....	$ 36.16	17.03
GROUP 3.....	$ 38.17	17.03
GROUP 4.....	$ 39.91	17.03

LABORERS - STRIPING CLASSIFICATIONS

GROUP 1: Protective coating, pavement sealing, including repair and filling of cracks by any method on any surface in parking lots, game courts and playgrounds; carstops; operation of all related machinery and equipment; equipment repair technician

GROUP 2: Traffic surface abrasive blaster; pot tender - removal of all traffic lines and markings by any method (sandblasting, waterblasting, grinding, etc.) and preparation of surface for coatings. Traffic control person: controlling and directing traffic through both conventional and moving lane closures; operation of all related machinery and equipment

GROUP 3: Traffic delineating device applicator: Layout and application of pavement markers, delineating signs, rumble and traffic bars, adhesives, guide markers, other traffic delineating devices including traffic control. This category includes all traffic related surface preparation (sandblasting, waterblasting, grinding) as part of the application process. Traffic protective delineating system installer: removes, relocates, installs, permanently affixed roadside and parking delineation barricades, fencing, cable anchor, guard rail, reference signs, monument markers; operation of all related machinery and equipment; power broom sweeper

GROUP 4: Striper: layout and application of traffic stripes and markings; hot thermo plastic; tape traffic stripes and markings, including traffic control; operation of all related machinery and equipment

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LABO1414-003 08/03/2016

	Rates	Fringes
LABORER		
PLASTER CLEAN-UP LABORER....	$ 31.60	19.28
PLASTER TENDER.....	$ 34.15	19.28

Work on a swing stage scaffold: $1.00 per hour additional.

Work at Military Bases - $3.00 additional per hour:
Coronado Naval Amphibious Base, Fort Irwin, Marine Corps Air Station-29 Palms, Imperial Beach Naval Air Station, Marine Corps Logistics Supply Base, Marine Corps Pickle Meadows, Mountain Warfare Training Center, Naval Air Facility-Seeley, North Island Naval Air Station, Vandenberg AFB.

PAIN0036-001 07/01/2015

	Rates	Fringes
Painters: (Including Lead Abatement)		
(1) Repaint (excludes San Diego County)	$ 27.29	12.83
(2) All Other Work	$ 30.72	12.83

REPAINT of any previously painted structure. Exceptions: work involving the aerospace industry, breweries, commercial recreational facilities, hotels which operate commercial establishments as part of hotel service, and sports facilities.

PAIN0036-010 10/01/2015

	Rates	Fringes
DRYWALL FINISHER/TAPER		
(1) Building & Heavy Construction	$ 27.84	15.20
(2) Residential Construction (Wood frame apartments, single family homes and multi-duplexes up to and including four stories)	$ 21.00	13.91

PAIN0036-012 10/01/2016

	Rates	Fringes
GLAZIER	$ 41.55	11.93

PAIN0036-019 01/01/2016

	Rates	Fringes
SOFT FLOOR LAYER	$ 26.77	13.53

PLAS0200-005 08/06/2015

	Rates	Fringes
PLASTERER	$ 38.44	13.77

NORTH ISLAND NAVAL AIR STATION, COLORADO NAVAL AMPHIBIOUS BASE, IMPERIAL BEACH NAVAL AIR STATION: $3.00 additional per hour.

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* PLAS0500-001 07/01/2016

	Rates	Fringes
CEMENT MASON/CONCRETE FINISHER		
GROUP 1	$ 23.84	21.17
GROUP 2	$ 25.49	21.17
GROUP 3	$ 27.57	21.17

CEMENT MASONS - work inside the building line, meeting the following criteria:

GROUP 1: Residential wood frame project of any size; work classified as Type III, IV or Type V construction; interior tenant improvement work regardless the size of the project; any wood frame project of four stories or less.

GROUP 2: Work classified as type I and II construction

GROUP 3: All other work

PLUM0016-006 07/01/2016

	Rates	Fringes
PLUMBER, PIPEFITTER, STEAMFITTER		
Camp Pendleton	$ 51.69	21.41
Plumber and Pipefitter All other work except work on new additions and remodeling of bars, restaurant, stores and commercial buildings not to exceed 5,000 sq. ft. of floor space and work on strip malls, light commercial, tenant improvement and remodel work	$ 47.19	21.41
Work ONLY on new additions and remodeling of commercial buildings, bars, restaurants, and stores not to exceed 5,000 sq. ft. of floor space	$ 45.73	20.43
Work ONLY on strip malls, light commercial, tenant improvement and remodel work	$ 35.69	18.76

PLUM0016-011 07/01/2016

	Rates	Fringes
PLUMBER/PIPEFITTER		
Residential	$ 38.17	17.33

PLUM0345-001 07/01/2014

	Rates	Fringes
PLUMBER		
Landscape/Irrigation Fitter	$ 29.27	19.75
Sewer & Storm Drain Work	$ 33.24	17.13

ROOF0045-001 07/01/2012

	Rates	Fringes
ROOFER	$ 25.08	7.28

SFCA0669-001 04/01/2016

	Rates	Fringes
SPRINKLER FITTER	$ 37.67	19.56

SHEE0206-001 07/01/2015

	Rates	Fringes
SHEET METAL WORKER		
Camp Pendleton	$ 37.55	23.23
Except Camp Pendleton	$ 35.33	23.23
Sheet Metal Technician	$ 25.22	6.69

SHEET METAL TECHNICIAN - SCOPE:
a. Existing residential buildings, both single and multi-family, where each unit is heated and/or cooled by a separate system b. New single family residential buildings including tracts. c. New multi-family residential buildings, not exceeding five stories of living space in height, provided each unit is heated or cooled by a separate system. Hotels and motels are excluded. d. LIGHT COMMERCIAL WORK: Any sheet metal, heating and air conditioning work performed on a project where the total construction cost, excluding land, is under $1,000,000 e. TENANT IMPROVEMENT WORK: Any work necessary to finish interior spaces to conform to the occupants of commercial buildings, after completion of the building shell

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* TEAM0036-001 07/04/2016

	Rates	Fringes
Truck drivers:		
GROUP 1	$ 15.90	30.69

GROUP 2.....	$ 23.49	30.69
GROUP 3.....	$ 23.69	30.69
GROUP 4.....	$ 23.89	30.69
GROUP 5.....	$ 24.09	30.69
GROUP 6.....	$ 24.59	30.69
GROUP 7.....	$ 26.09	30.69

FOOTNOTE: HAZMAT PAY: Work on a hazmat job, where hazmat certification is required, shall be paid, in addition to the classification working in, as follows: Levels A, B and C - +$1.00 per hour. Workers shall be paid hazmat pay in increments of four (4) and eight (8) hours.

TRUCK DRIVER CLASSIFICATIONS

GROUP 1: Fuel Man, Swamper

GROUP 2: 2-axle Dump Truck, 2-axle Flat Bed,Concrete Pumping Truck, Industrial Lift Truck, Motorized Traffic Control, Pickup Truck on Jobsite

GROUP 3: 2-axle Water Truck, 3-axle Dump Truck, 3-axle Flat Bed, Erosion Control Nozzleman, Dump Crete Truck under 6.5 yd, Forklift 15,000 lbs and over, Prell Truck, Pipeline Work Truck Driver, Road Oil Spreader, Cement Distributor or Slurry Driver, Bootman, Ross Carrier

GROUP 4: Off-road Dump Truck under 35 tons 4-axles but less than 7-axles, Low-Bed Truck & Trailer, Transit Mix Trucks under 8 yd, 3-axle Water Truck, Erosion Control Driver, Grout Mixer Truck, Dump Crete 6.5yd and over, Dumpster Trucks, DW 10, DW 20 and over, Fuel Truck and Dynamite, Truck Greaser, Truck Mounted Mobile Sweeper 2-axle Winch Truck

GROUP 5: Off-road Dump Truck 35 tons and over, 7-axles or more, Transit Mix Trucks 8 yd and over, A-Frame Truck, Swedish Cranes

GROUP 6: Off-Road Special Equipment (including but not limited to Water Pull Tankers, Athey Wagons, DJB, B70 Wuclids or like Equipment)

GROUP 7: Repairman

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

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Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (ii)).

The body of each wage determination lists the classification and wage rates that have been found to be prevailing for the cited type(s) of construction in the area covered by the wage determination. The classifications are listed in alphabetical order of "identifiers" that indicate whether the particular rate is a union rate (current union negotiated rate for local), a survey rate (weighted average rate) or a union average rate (weighted union average rate).

Union Rate Identifiers

A four letter classification abbreviation identifier enclosed in dotted lines beginning with characters other than "SU" or "UAVG" denotes that the union classification and rate were prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2014. PLUM is an abbreviation identifier of the union which prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. 07/01/2014 is the effective date of the most current negotiated rate, which in this example is July 1, 2014.

Union prevailing wage rates are updated to reflect all rate changes in the collective bargaining agreement (CBA) governing this classification and rate.

Survey Rate Identifiers

Classifications listed under the "SU" identifier indicate that no one rate prevailed for this classification in the survey and the published rate is derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As this weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SULA2012-007 5/13/2014. SU indicates the rates are survey rates based on a weighted average calculation of rates and are not majority rates. LA indicates the State of Louisiana. 2012 is the year of survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. 5/13/2014 indicates the survey completion date for the classifications and rates under that identifier.

Survey wage rates are not updated and remain in effect until a new survey is conducted.

Union Average Rate Identifiers

Classification(s) listed under the UAVG identifier indicate that no single majority rate prevailed for those classifications; however, 100% of the data reported for the classifications was union data. EXAMPLE: UAVG-OH-0010

08/29/2014. UAVG indicates that the rate is a weighted union average rate. OH indicates the state. The next number, 0010 in the example, is an internal number used in producing the wage determination. 08/29/2014 indicates the survey completion date for the classifications and rates under that identifier.

A UAVG rate will be updated once a year, usually in January of each year, to reflect a weighted average of the current negotiated/CBA rate of the union locals from which the rate is based.

WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can be:

* an existing published wage determination
* a survey underlying a wage determination
* a Wage and Hour Division letter setting forth a position on a wage determination matter
* a conformance (additional classification and rate) ruling

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour Regional Office for the area in which the survey was conducted because those Regional Offices have responsibility for the Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:

Branch of Construction Wage Determinations
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

2.) If the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

Wage and Hour Administrator
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3.) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

4.) All decisions by the Administrative Review Board are final.

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END OF GENERAL DECISION

APPENDIX N

ASBESTOS ABATEMENT SPECIFICATION

THE CITY OF SAN DIEGO

ENVIRONMENTAL SERVICES DEPARTMENT

ASBESTOS ABATEMENT SPECIFICATION

for

69th & MOHAWK PUMP STATION

CLEARANCE ACTIVITY

September 29, 2016

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Environmental Services Department
Disposal & Environmental Protection
Asbestos & Lead Management Program
9601 Ridgehaven Court, Ste 320
San Diego, CA 92123
Tel: (858) 492-5086
Fax: (858) 492-5041

I. GENERAL REQUIREMENTS

A. DESCRIPTION OF WORK

1. ABATEMENT CONTRACTOR shall supply all labor, transportation, material, apparatus, and equipment for the removal, and disposal of asbestos-containing materials (ACM) to be impacted as a result of this project, as identified in Appendix C of this section.

2. ABATEMENT CONTRACTOR shall be responsible for ensuring the building will not be contaminated with asbestos containing material during work and shall be responsible for any clean-up determined necessary by City of San Diego's PROJECT MONITOR.

3. Before submitting his/her bid, the ABATEMENT CONTRACTOR shall visit the project site and verify the location of the asbestos-containing materials that will be removed under the terms and conditions of the contract and this specification.

4. Abatement work shall be performed within agreed upon hours submitted prior to project start which will not include designated City holidays.

5. Before the beginning of the work related to asbestos abatement, ABATEMENT CONTRACTOR shall hold a safety construction meeting with all asbestos related supervisors, workers, and other contractors on-site that provides an overview of the accepted asbestos work plan, decontamination procedures specific to this project (decontamination procedures shall be on paper with copies for all present), and disposal plan for this project. Meeting shall include the PROJECT MONITOR and any other designated City representative.

B. CONTRACTOR USE OF THE PREMISES

1. 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 asbestos abatement activities. The ABATEMENT CONTRACTOR will be responsible for adhering to all applicable building codes and fire safety requirements.

2. All public areas will be kept free of accumulated waste, materials, rubbish, and debris.

C. PROJECT COORDINATION

1. It will be the responsibility of the ABATEMENT CONTRACTOR to coordinate all site activities with the City's Asbestos & Lead Management Program's (ALMP) PROJECT MONITOR including any meetings, surveys, special reports, and site usage limitations.

D. PROJECT SUBMITTALS

The ABATEMENT CONTRACTOR shall not commence any work until approval has been given from the City. The ABATEMENT CONTRACTOR shall submit the following at least 60 days prior to commencement of any asbestos abatement activities:

1. Asbestos Abatement Work Plan:

a) In addition to information required in this section, Work Plan shall contain all information required under Title 8 CCR 1529. Submit a detailed job-specific plan that includes:

(1) The procedures proposed to comply with the requirements of this specification and all applicable regulations.

(2) Detailed drawings that identify the location, size, layout and details of the Work Areas, any equipment, disposal storage, restrooms, and worker decontamination facilities.

(3) The sequencing of abatement work and the interface of trades involved in the performance of work. Provide a time line that details each major phase of work activity and anticipated time it will occur.

(4) The methods to be used to assure the safety of occupants and visitors to the site.

(5) Detailed description of the methods to be employed to ensure asbestos is not released above background air levels.

(6) The method of removal to minimize asbestos dust generation in the Work Area,

b) Work site coordination submittals including:

(1) Contingency and Spill Plan: Prepare a contingency plan for emergencies including fire, accident, power failure, or any other event that may require modification or abridgement of decontamination or Work Area isolation procedures. Include in plan specific procedures for decontamination or Work Area isolation. Plan should be specific for all types of hazardous materials or situations specific to this work site. Note that nothing in this specification should impede safe exiting or providing of adequate medical attention in the event of an emergency.

(2) Telephone numbers and locations of emergency services including but not limited to fire, ambulance, doctor, hospital, police, power company, telephone company.

2. Notifications:

a) If required by regulations, submit copies of notifications made to regulatory agencies along with a copy of certified mail receipt.

b) Notify emergency service agencies including fire, ambulance, police or other agency that may service the abatement work site in case of an emergency. Notification is to include methods of entering Work Area,

emergency entry and exit locations, modifications to fire notification or fire-fighting equipment, and other information needed by agencies providing emergency services.

c) Notifications of Emergency: Any individual at the job site may notify emergency service agencies if necessary without effect on this contract or the Contract Sum.

d) Provide submittal identifying person responsible for responding to project site emergencies twenty-four hours a day, seven days a week.

3. ABATEMENT CONTRACTOR qualifications and personnel Information submittals that include but are not limited to:

a) Submit a copy of the ABATEMENT CONTRACTOR's Asbestos DOSH Handling License.

b) Identify state licensed transporter, disposal location, and associated permits for all asbestos waste.

c) Provide all staff names, certifications, and experience. Identify their duties and responsibilities on this project. ABATEMENT CONTRACTOR shall have the following minimum levels of qualified supervision on the project site:

(1) General Superintendent: Provide a full-time General Superintendent who is experienced in administration and supervision of asbestos abatement projects including work practices, protective measures for building and personnel, disposal procedures, etc. This person is the ABATEMENT CONTRACTOR`s representative responsible for compliance with all applicable federal, state and local regulations and guidelines, particularly those relating to asbestos abatement and hazardous waste. Should, in the opinion of the OWNER, any language barrier exist between the on-site superintendent and the OWNER or PROJECT MONITOR, the ABATEMENT CONTRACTOR shall employ a qualified full-time interpreter or provide a new on-site superintendent at no additional cost to the OWNER. Shall be AHERA certified as asbestos supervisor.

(2) Foreman: Provide a full time Foreman to directly supervise and direct no more than 10 abatement workers. Each Foreman will act as the Competent Person as required by Title 8 CCR 1529 for the workers the foreman is directing. The Foreman has oversight authority over the workers and reports to the General Superintendent. If there are 10 or fewer abatement workers on the project the General Superintendent may fill the Foreman's position. Shall be AHERA certified as asbestos supervisor.

(3) Experience and Training: The General Superintendent and foreman shall meet all the requirements as a Competent Person as required by Title 8 CCR 1529. They shall have completed training in

EPA Asbestos Supervisor Training. They shall have experience with projects of similar types and sizes.

(4) Workers: All asbestos abatement workers shall have current EPA and OSHA asbestos abatement training.

(5) Certificate of Worker's Acknowledgment: Submit an original signed copy of the Certificate of Worker's Acknowledgment found in Appendix A of this section, for each worker and supervisor who is to be at the job site or enter the Work Area.

d) Submit respiratory protection information and air monitoring data as per the following:

(1) Operating Instruction: Submit complete operating and maintenance instructions for all components and systems as a whole. Submittal is to be in bound manual form suitable for field use.

(2) Respiratory Protection Program: Submit ABATEMENT CONTRACTOR's written respiratory protection program manual as required by Title 8 CCR 1529 and 5144.

(3) Respiratory Protection Schedule: Submit level of respiratory protection intended for each operation required by the project.

(4) Copies of current respirator fit test: Fit tests must be performed every 6 months.

e) Submit doctor's report from medical examination conducted within the last 12 months as part of compliance with OSHA medical surveillance requirements for each worker who is to enter the Work Area. Submit, at a minimum, the following for each worker:

(1) Name and Social Security Number

(2) Physicians Written Opinion from examining physician including at a minimum the following:

(a) Whether worker has any detected medical conditions that would place the worker at an increased risk of material health impairment from exposure to asbestos. Any recommended limitations on the worker or on the use of personal protective equipment such as respirators.

(b) Statement that the worker has been informed by the physician of the results of the medical examination and of any medical conditions that may result from asbestos exposure.

f) Submit a notarized certification, signed by an officer of the ABATEMENT CONTRACTOR firm that exposure measurements, medical surveillance, and worker training records are being kept in conformance with Title 8 CCR 1529.

g) Identify the laboratory that will be performing the analysis of the personal samples and provide their accreditation. Also discuss the method by which the ABATEMENT CONTRACTOR will provide the analytical results to the PROJECT MONITOR within 24 hours of sampling completion.

4. Submit the following during and at the completion of the work

a) Copies of all Waste Shipment Records

b) Copies of all air monitoring results within 24 hours

5. At the end of a project, the ABATEMENT CONTRACTOR shall submit the following to the PROJECT MONITOR:

a) Personal Air Sample Results

b) Copies of Project Daily Logs

c) Containment Entry/Exit Logs

d) Waste Disposal Documentation

e) Certificate of Visual Inspection

E. SCHEDULES AND REPORTS

1. Prior to each phase of project, the ABATEMENT 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.

F. PRODUCT DATA

1. The ABATEMENT CONTRACTOR shall submit product information that is to be used during the abatement activities prior to commencement of work (i.e., encapsulants). General information required includes manufacturer's standard printed recommendations for application and use, compliance with recognized standards of trade association and testing agencies, and safety data sheets (SDSs).

2. Polyethylene sheet

a) A single polyethylene film in the largest sheet size possible to minimize seams, 4.0 or 6.0 mil thick as indicated, and clear, frosted, or black as indicated.

b) Provide flame resistant polyethylene film that conforms to requirements set forth by the National Fire Protection Association Standard 701, Small Scale Fire Test for Flame-resistant Textiles and Films. Provide largest size possible to minimize seams, 4.0 or 6.0 mil thick as indicated, and frosted or black as indicated.

c) Reinforced Polyethylene Sheet: Where plastic sheet is the only separation between the Work Area and building exterior, provide translucent, nylon reinforced, laminated, flame resistant, polyethylene film that conforms to requirements set forth by the National Fire Protection Association Standard 701, Small Scale Fire Test for Flame-resistant Textiles

and Films. Provide largest size possible to minimize seams, 4.0 or 6.0 mil thick as indicated, frosted or black as indicated.

3. Tape

a) Provide duct tape in 2" or 3" widths as indicated, with an adhesive which is formulated to stick aggressively to sheet polyethylene.

4. Spray adhesive

a) Provide spray adhesive in aerosol cans which is specifically formulated to stick tenaciously to sheet polyethylene.

G. PROJECT CLOSE-OUT

1. Upon completion of work and prior to payment, the PROJECT MONITOR will proceed with an initial inspection of the abatement work area. A Certificate of Visual Inspection (Appendix B) will be signed by both the ABATEMENT CONTRACTOR and PROJECT MONITOR. The ABATEMENT CONTRACTOR will not be paid until the area meets the established project-specific clearance criteria and has submitted the required information.

II. DEFINITIONS

A. 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.

B. ABATEMENT CONTRACTOR: The designated sub-contractor performing the required abatement work outlined in this specification.

C. ACCREDITED or ACCREDITATION (when referring to a person or laboratory): A person or laboratory accredited in accordance with section 206 of Title II of the Toxic Substances Control Act (TSCA).

D. AIR MONITORING: The process of measuring the fiber content of a specific volume of air.

E. AMENDED WATER: Water to which a surfactant has been added to decrease the surface tension to 35 or less dynes.

F. ASBESTOS: The asbestiform varieties of serpentinite (chrysotile), riebeckite (crocidolite), cummingtonite grunerite, anthophyllite, and actinolite tremolite. For purposes of determining respiratory and worker protection both the asbestiform and non-asbestiform varieties of the above minerals and any of these materials that have been chemically treated and/or altered shall be considered as asbestos.

G. ASBESTOS CONTAINING MATERIAL (ACM): Any material containing more than 1% by weight of asbestos of any type or mixture of types.

H. ASBESTOS-CONTAINING BUILDING MATERIAL (ACBM): Surfacing ACM, thermal system insulation ACM, or miscellaneous ACM that is found in or on interior structural members or other parts of a building.

I. ASBESTOS CONTAINING WASTE MATERIAL: Any material which is or is suspected of being or any material contaminated with an asbestos containing material which is to be removed from a work area for disposal.

J. ASBESTOS DEBRIS: Pieces of ACBM that can be identified by color, texture, or composition, or means dust, if the dust is determined by an accredited inspector to be ACM.

K. AUTHORIZED VISITOR: The Owner, the Owner's Representative, testing lab personnel, the Architect/Engineer, emergency personnel or a representative of any federal, state and local regulatory or other agency having authority over the project.

L. BARRIER: Any surface that seals off the work area to inhibit the movement of fibers.

M. BREATHING ZONE: A hemisphere forward of the shoulders with a radius of approximately 6 to 9 inches.

N. DEMOLITION: The wrecking or taking out of any building component, system, finish or assembly of a facility together with any related handling operations.

O. DISPOSAL BAG: A properly labeled 6 mil thick leak tight plastic bags used for transporting asbestos waste from work and to disposal site.

P. ENCAPSULANT: A penetrating encapsulant specifically designed to minimize fiber release during removal of asbestos containing materials rather that for in situ encapsulation.

Q. ENCAPSULATION: Treatment of asbestos containing materials, with an encapsulant.

R. ENCLOSURE: The construction of an air tight, impermeable, permanent barrier around asbestos containing material to control the release of asbestos fibers into the air.

S. FILTER: A media component used in respirators to remove solid or liquid particles from the inspired air.

T. FRIABLE ASBESTOS MATERIAL: Material that contains more than 1.0% asbestos by weight and that can be crumbled, pulverized, or reduced to powder by hand pressure when dry. A material can also be rendered friable via mechanical means.

U. HEPA FILTER: A High Efficiency Particulate Air (HEPA) filter capable of trapping and retaining 99.97% of asbestos fibers greater than 0.3 microns in diameter.

V. 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 asbestos fibers. Filters should be of 99.97% efficiency for retaining fibers of 0.3 microns or larger.

W. NEGATIVE PRESSURE RESPIRATOR: A respirator in which the air pressure inside the respiratory inlet covering is positive during exhalation in relation to the air pressure of the outside atmosphere and negative during inhalation in relation to the air pressure of the outside atmosphere.

X. PERSONAL MONITORING: Sampling of the asbestos fiber concentrations within the breathing zone of an employee.

Y. 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.

Z. PROJECT MONITOR: City of San Diego Asbestos & Lead Management Program staff or their designated consultant.

AA. VISIBLE EMISSIONS: Any emissions containing particulate asbestos material that are visually detectable without the aid of instruments. This does not include condensed uncombined water vapor.

BB. WET CLEANING: The process of eliminating asbestos 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 as asbestos-contaminated waste.

CC. WORK AREA: The area where asbestos-related work or removal operations are performed which is defined and/or isolated to prevent the spread of asbestos dust, fibers or debris, and entry by unauthorized personnel. Work area is a Regulated Area as defined by Title 8 CCR 1529

III. SITE WORK

A. INTRODUCTION

This portion of the specification describes procedures and protocols for asbestos abatement 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.

B. BACKGROUND INFORMATION

Sampling of building materials 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.

C. GENERAL INFORMATION

1. Potential Asbestos Hazard

The disturbance of asbestos containing materials 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. The procedures and methods described herein must be followed and the ABATEMENT CONTRACTOR must comply with all applicable federal/state/local requirements.

2. Stop Work

If the PROJECT MONITOR presents a verbal or written stop work order, the ABATEMENT CONTRACTOR shall immediately and automatically stop all work. Recommencement of the work may not begin until authorized by the PROJECT MONITOR.

D. PROJECT ADMINISTRATION

1. Certified Supervisor

The ABATEMENT CONTRACTOR needs to provide a full-time asbestos abatement supervisor who is experienced in administration and supervision of asbestos abatement projects including work practices, protective measures for building and personnel, disposal procedures, etc. This supervisor must have completed an "Asbestos Abatement Supervision" course. This person will act as the competent person on the job.

In addition, all employees working on the project must have taken an "Asbestos Abatement Worker" course.

E. SPECIAL REPORTS

1. Reporting Unusual Events

When an event of unusual and significant nature occurs at the site (e.g., a spill of asbestos debris, failure of special equipment used to contain asbestos), the ABATEMENT CONTRACTOR shall prepare and submit a special report listing the chain of events, persons participating, response by ABATEMENT CONTRACTOR's personnel, evaluation of results, and other pertinent information.

2. Reporting Accidents

The ABATEMENT 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.

F. COMPLIANCE WITH CODES AND REGULATIONS

1. Except to the extent that more explicit, or more stringent requirements are written directly into this Asbestos Abatement 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.

2. The ABATEMENT 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 ABATEMENT CONTRACTOR shall hold the City and its representative harmless for the ABATEMENT 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 sub ABATEMENT CONTRACTORs.

3. State requirements which govern asbestos abatement activities or hauling and disposal of hazardous waste include, but are not limited to, the following:

a) As required, ABATEMENT CONTRACTOR shall notify all Local, State, and Federal agencies regulating standards for the removal of asbestos-containing materials, including but not limited to: Cal-OSHA, San Diego Air Pollution Control District, and U.S. Environmental Protection Agency. ABATEMENT CONTRACTOR shall provide Owner a copy of each notification and a copy of a certified mail receipt proving proper notification to all required agencies.

b) ABATEMENT CONTRACTOR shall be registered as an asbestos contractor before performing any asbestos related work; a licensee must also be registered with the Department of Industrial Relations, Division of Occupational Safety and Health.

c) Transportation of hazardous materials shall be in accordance with the State of California Title 22 and the Department of Transportation regulations.

d) ABATEMENT CONTRACTOR shall comply with all provisions of California Title 8, Section 5208 and Section 1529.

e) ABATEMENT CONTRACTOR shall be in compliance with all provisions of Title 40 CFR Part 61.

f) ABATEMENT CONTRACTOR shall assume full responsibility and liability for compliance with all applicable Federal, State, and local regulations pertaining to work practices, hauling, disposal, and protection of workers, visitors to site, and persons occupying areas adjacent to the site.

G. PERMITS AND LICENSES

The ABATEMENT CONTRACTOR shall submit to the City in the bid submittal any permits or licenses necessary to carry out this work.

1. 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).

2. Licenses

The ABATEMENT CONTRACTOR must be certified by the California Contractors State License Board. The ABATEMENT 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.

H. HEALTH AND SAFETY

This section describes the equipment and procedures required for protecting workers from asbestos contamination and other workplace hazards.

1. Provide worker protection as required by the most stringent OSHA and/or EPA standards applicable to the work.

2. Training

a) All workers are to be trained, certified and accredited as required by state or local code or regulation.

b) Train all workers, in accordance with Title 8 CCR section 5208 and section 1529, regarding the dangers inherent in handling asbestos and breathing asbestos dust, proper work procedures, and personal and area protective measures.

c) Provide medical examinations for all workers who may encounter an airborne fiber level of 0.1 fibers/cc or greater for an 8 hour Time Weighted Average. In the absence of specific airborne fiber data, provide medical examinations for all workers who will enter the Work Area for any reason. Examination shall as a minimum meet requirements as set forth in Title 8 CCR 1529. In addition, provide an evaluation of the individual's ability to work in environments capable of producing heat stress in the worker.

3. Protective clothing

a) Coveralls: Provide disposable "full body" coveralls and disposable head covers, and require that they be worn at all times by all workers in the Work Area. Provide a sufficient number for all required changes, for all workers in the Work Area.

b) Boots: Provide work boots with non-skid soles, and where required by OSHA, foot protection for all workers. Provide boots at no cost to workers. Do not allow boots to be removed from the Work Area for any reason, after being contaminated with asbestos-containing material.

Thoroughly clean, decontaminate and bag boots before removing them from Work Area at the end of the work.

c) Hard Hats: Provide head protection (hard hats) as required by OSHA for all workers, and provide 1 spare for use by Owner's Representative, Project Administrator, and Owner. Require hard hats to be worn at all times that work is in progress that may potentially cause head injury. Provide hard hats of the type with plastic strap suspension. Require hats to remain in the Work Area throughout the work. Thoroughly clean, decontaminate and bag hats before removing them from Work Area at the end of the work.

d) Goggles: Provide eye protection (goggles) as required by OSHA for all workers involved in scraping, spraying, or any other activity which may potentially cause eye injury. Thoroughly clean, decontaminate and bag goggles before removing them from Work Area at the end of the work.

e) Gloves: Provide work gloves to all workers and require that they be worn at all times in the Work Area. Do not remove gloves from Work Area and dispose of as asbestos-contaminated waste at the end of the work.

4. Respirators

a) Air Purifying Respirators

(1) Respirator Bodies: Provide half face or full face type respirators based upon appropriate protection factor as determined by the ABATEMENT CONTRACTORS competent person. .

(2) Filter Cartridges: Provide, at a minimum, HEPA type filters labeled with NIOSH and MSHA Certification for "Radionuclides, Radon Daughters, Dust, Fumes, Mists including Asbestos Containing Dusts and Mists" and color coded in accordance with ANSI Z228.2 (1980). In addition, a chemical cartridge section may be added, if required, for solvents, etc., in use. In this case, provide cartridges that have each section of the combination canister labeled with the appropriate color code and NIOSH/MSHA Certification.

(3) Non permitted respirators: Do not use single use, disposable or quarter face respirators.

(4) Require that respiratory protection be used at all times when there is any possibility of disturbance of asbestos containing materials whether intentional or accidental.

(5) Require that a respirator be worn by anyone in a Work Area at all times, regardless of activity, during a period that starts with any operation which could cause airborne fibers until the area has been cleared for re occupancy.

(6) Regardless of Airborne Fiber Levels: Require that the minimum level of respiratory protection used will be half-face air purifying respirators with high efficiency filters.

b) Fit testing

(1) Initial Fitting: Provide initial fitting of respiratory protection during a respiratory protection course of training. Only allow an individual to use respirators for which training and fit testing has been provided.

(2) Upon Each Wearing: Require that each time an air purifying respirator is put on it be checked for fit with a positive and negative pressure fit check in accordance with the manufacturer's instructions or ANSI Z88.2 (1980).

c) Respirators, disposable coveralls, head covers, and foot covers shall be provided by the ABATEMENT CONTRACTOR for the City of San Diego's Asbestos and Lead Management Program's PROJECT MONITOR, and other authorized representatives who may inspect the job site. Provide two (2) respirators and six (6) complete coveralls and, where applicable, six (6) respirator filter changes per day.

5. Materials and Equipment

a) Only material and equipment that are recognized as being suitable for the intended use, by compliance with appropriate standards, may be used.

6. Water Service

a) The ABATEMENT 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.

7. Electrical Services

a) The ABATEMENT 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 ABATEMENT CONTRACTOR shall provide their own electrical hook-ups, i.e. spider boxes, ground fault circuit interrupter (GFCI) etc. and installed by a licensed electrician.

b) 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.

8. Sanitary Facilities

a) The ABATEMENT CONTRACTOR shall provide sanitary facilities on site, if none have been made available by the City.

9. Fire Extinguisher

a) Applicable recommendations of the National Fire Protection Association (NFPA) Standard 10, "Standard for Portable Fire Extinguishers," must be complied with by the ABATEMENT 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.

10. First Aid

a) The ABATEMENT CONTRACTOR will need to provide first aid supplies which should comply with the governing regulations and recognized recommendations within the construction industry.

I. WORK AREA PROCEDURES

1. Require that workers NOT eat, drink, smoke, chew tobacco or gum, or apply cosmetics in the Work Area.

2. ABATEMENT CONTRACTOR shall secure work area from access by public, staff or users of the area. Accomplish this where possible, by locking doors, gates, or other means of access to the area.

3. Barricade fencing is required for securing an outside area from unauthorized access. Work area delineation shall occur at no less then twelve feet (12') from the radius of the work and/or building. Yellow caution tape shall not be used.

4. All windows, vents, mechanical systems, etc., in close proximity to the abatement area shall be sealed with plastic and tape by the ABATEMENT CONTRACTOR prior to the work beginning.

5. Provide warning signs at entry to work area in accordance with California Title 8, Section 1529.

6. A visitor entry and exit-log, and an employee daily sign-in log shall be maintained throughout the asbestos abatement activities. The ABATEMENT CONTRACTOR shall be responsible for the project site security during the operations in order to protect work efforts and equipment.

J. REMOVAL OF ASBESTOS-CONTAINING MATERIALS

1. Asbestos-containing materials shall be adequately wetted with either amended water or a removal encapsulant before and during removal process, to reduce fiber emission.

2. The ABATEMENT CONTRACTOR should exercise caution in using water, as he will be solely responsible for any water damage to the facility resulting from the work.

3. ABATEMENT CONTRACTOR is responsible for keeping all asbestos containing debris within the containment area at all times throughout removal. Any interior contamination, if created, is the responsibility of the ABATEMENT CONTRACTOR to clean at no additional cost to the City.

4. ABATEMENT CONTRACTOR shall ensure there is no loose debris around the Work Area during the removal and if found, ABATEMENT CONTRACTOR shall clean the area immediately.

K. DISPOSAL

1. Both non-friable and friable ACM shall be containerized immediately, secured in a locked container, be transported by state licensed hauler with manifest, and disposed of at appropriate landfill location.

2. The PROJECT MONITOR or designated representative will inspect each load and sign all waste manifests before waste leaves the site.

3. Copies of Waste Shipment Records for each load of asbestos waste material shall be given to the City.

4. Cordon off the Work Area, a safe zone around the building, and the dumpster area with barrier fencing. Yellow caution tape shall not be used.

5. Provide warning signs at Work Area access in accordance with Title 8 CCR 1529

L. DECONTAMINATION PROCEDURE

1. Prior to leaving the Work Area, HEPA vacuum outer suit completely and remove, turning it inside out while doing so.

2. Hygiene facilities such as change rooms and showers are not required to be adjacent to the operations on top of Work Areas on top of a roof, but these facilities must be provided [Title 8, Section 1529 (1)(3)]. Proceed to decontamination area where the second suit is to be removed while turning it inside out.

3. After wiping all areas and respirator, remove respirator and wipe facial area clean.

4. Place contaminated suits, towels, and respirator cartridges in a properly labeled asbestos waste bag.

5. At the completion of the project, boots, hard hats, and goggles should be decontaminated and bagged prior to removal from the Work Area.

6. Equipment leaving the Work Area should be HEPA vacuumed and wet wiped.

M. AIR MONITORING/WORK AREA CLEARANCE

1. The City's PROJECT MONITOR will provide ambient area air monitoring during all phases of the removal of asbestos-containing materials, including the interior and/or exterior of the facility.

2. During the project, personal air monitoring will be conducted by ABATEMENT CONTRACTOR to determine fiber levels. If fiber levels exceed 0.05 fibers/cc then work shall cease and not begin again until after PROJECT MONITOR approves the ABATEMENT CONTRACTOR's revised methodology which will lower fiber levels. Procedures shall be submitted in writing to the City prior to implementing these procedures. At a minimum, ABATEMENT CONTRACTOR shall provide air monitoring for every four workers. Testing of air samples will be by Phase Contrast Microscopy following NIOSH 7400 rules.

3. If any of the ambient area samples taken by the PROJECT MONITOR either inside or outside exceed .01 fibers/cc then ABATEMENT CONTRACTOR is required to pay for the additional testing on those samples collected using transmission electron microscopy (TEM).

4. Release of the ABATEMENT CONTRACTOR from the asbestos-containing material removal phase of the contract will be determined by the PROJECT MONITOR based upon the results of visual inspection and/or clearance air sampling.

N. TRANSPORTATION AND DISPOSAL

1. 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 Title 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.

2. All additional pre-transportation labeling, marking or placarding must be conducted prior to transporting off site and in accordance with Title 22 CCR Chapter 12, Article 3.

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.

4. A hazardous waste manifest will be completed in accordance with Title 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 shall sign as the generator on manifests

APPENDIX A

CERTIFICATE OF WORKER'S ACKNOWLEDGMENT

PROJECT NAME: _____ DATE: _____

PROJECT ADDRESS: _____

CONTRACTOR'S NAME: _____

Working with asbestos can be dangerous. Inhaling asbestos fibers has been linked with various types of cancer. If you smoke and inhale asbestos fibers the chance that you will develop lung cancer is greater than that of the non-smoking public.

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 things 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 have been trained in the dangers inherent in handling asbestos and breathing asbestos dust and in proper work procedures and personal and area protective measures. The topics covered in the course must have included the following:

- Physical characteristics of asbestos
- Health hazards associated with asbestos
- Respiratory protection
- Use of protective equipment
- Pressure Differential Systems
- Work practices including hands on or on job training
- Personal decontamination procedures
- Air monitoring, personal and area

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, pulmonary function tests and may have included an evaluation of a chest x ray.

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 ABATEMENT 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

SUMMARY OF ASBESTOS RESULTS

Sample #	Material	Location	Condition	Asbestos (%)
6913-017	Exterior Stucco	Storage House	Good	2-3% Chrysotile
6913-B-025	Exterior Stucco (Same material)	Storage House (Same Location)	Good	.75% Chrysotile* 400 Point Count

*The Stucco is less than 1% asbestos but greater than .1 % asbestos

APPENDIX O

LEAD CONTAINING MATERIALS ABATEMENT SPECIFICATION

THE CITY OF SAN DIEGO

ENVIRONMENTAL SERVICES DEPARTMENT

LEAD CONTAINING MATERIALS

ABATEMENT SPECIFICATION

for

69th & MOHAWK PUMP STATION

CLEARANCE ACTIVITY

September 29, 2016

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CDPH IA/PM/S License# 5464

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Environmental Services Department
Disposal & Environmental Protection
Asbestos & Lead Management Program
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San Diego, CA 92123
Tel: (858) 492-5086
Fax: (858) 492-5089

I. GENERAL REQUIREMENTS

A. DESCRIPTION OF WORK

1. ABATEMENT CONTRACTOR shall supply all labor, transportation, material, apparatus, and equipment for the removal, and disposal of lead containing materials to be impacted as a result of this project, as identified in Appendix C of this section.

2. ABATEMENT CONTRACTOR shall be responsible for ensuring the surrounding areas will not be contaminated with lead containing materials during work and shall be responsible for any clean-up determined necessary by City of San Diego's PROJECT MONITOR.

3. Before submitting his/her bid, the ABATEMENT CONTRACTOR shall visit the project site and verify the location of the lead containing materials that will be removed under the terms and conditions of the contract and this specification.

4. All paint chips collected must be stored in sealable drum containers (not in bags).

5. Abatement work shall be performed within agreed upon hours submitted prior to project start which will not include designated City holidays.

6. Before the beginning of abatement work the ABATEMENT CONTRACTOR shall hold a safety construction meeting with all abatement supervisors, workers, and other contractors on-site that provides an overview of the accepted work plan, decontamination procedures specific to this project (decontamination procedures shall be on paper with copies for all present), and disposal plan for this project. Meeting shall include the PROJECT MONITOR and any other designated City representative.

B. CONTRACTOR USE OF THE PREMISES

1. 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 abatement activities. The ABATEMENT CONTRACTOR will be responsible for adhering to all applicable building codes and fire safety requirements.

2. All public areas will be kept free of accumulated waste, materials, rubbish, and debris.

C. PROJECT COORDINATION

1. It will be the responsibility of the ABATEMENT CONTRACTOR to coordinate all site activities with the City's Asbestos & Lead Management Program's (ALMP) PROJECT MONITOR including any meetings, surveys, special reports, and site usage limitations.

D. PROJECT SUBMITTALS

The ABATEMENT CONTRACTOR shall not commence any work until approval has been given from the City. The ABATEMENT CONTRACTOR shall submit the following at least 30 days prior to commencement of any lead abatement activities:

1. Lead Abatement Work Plan:

a) Submit a detailed job-specific plan that includes:

(1) The procedures proposed to comply with the requirements of this specification and all applicable regulations.

(2) Detailed drawings that identify the location, size, layout and details of the Work Areas, any equipment, disposal storage, restrooms, and worker decontamination facilities.

(3) The sequencing of abatement work and the interface of trades involved in the performance of work. Provide a time line that details each major phase of work activity and anticipated time it will occur.

(4) The methods to be used to assure the safety of occupants and visitors to the site.

(5) A description of methods to be used to control dispersion of hazardous materials to the interior and exterior of the building.

(6) The method of removal to minimize dust generation in the Work Area.

b) Work site coordination submittals including:

(1) Contingency and Spill Plan: Prepare a contingency plan for emergencies including fire, accident, power failure, or any other event that may require modification or abridgement of decontamination or Work Area isolation procedures. Include in plan specific procedures for decontamination or Work Area isolation. Plan should be specific for all types of hazardous materials or situations specific to this work site. Note that nothing in this specification should impede safe exiting or providing of adequate medical attention in the event of an emergency.

(2) Telephone numbers and locations of emergency services including but not limited to fire, ambulance, doctor, hospital, police, power company, telephone company.

2. Notifications:

a) Prior to any abatement activities the ABATEMENT 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.

b) Submit Cal/OSHA pre-job notification for lead-related construction work per Title 8 CCR 1532.1 subsection (p), "Lead-Work Pre-Job Notification".

c) Permits, notifications, and licenses needed to perform work (including hazardous waste hauler's registration)

d) Notify emergency service agencies including fire, ambulance, police or other agency that may service the abatement work site in case of an emergency. Notification is to include methods of entering Work Area, emergency entry and exit locations, modifications to fire notification or fire-fighting equipment, and other information needed by agencies providing emergency services.

e) Notifications of Emergency: Any individual at the job site may notify emergency service agencies if necessary without effect on this contract or the Contract Sum.

f) Provide submittal identifying person responsible for responding to project site emergencies twenty-four hours a day, seven days a week.

3. ABATEMENT CONTRACTOR qualifications and personnel information submittals that include but are not limited to:

a) Provide all staff names, certifications, and experience. Identify their duties and responsibilities on this project. ABATEMENT CONTRACTOR shall have the following minimum levels of qualified supervision on the project site:

(1) General Superintendent: Provide a full-time General Superintendent who is experienced in administration and supervision of lead abatement projects including work practices, protective measures for building and personnel, disposal procedures, etc. This person is the ABATEMENT CONTRACTOR`s representative responsible for compliance with all applicable federal, state and local regulations and guidelines, particularly those relating to lead abatement and hazardous waste. Should, in the opinion of the OWNER, any language barrier exist between the on-site superintendent and the OWNER or PROJECT MONITOR, the ABATEMENT CONTRACTOR shall employ a qualified full-time interpreter or provide a new on-site superintendent at no additional cost to the OWNER. Shall be CDPH certified as a Lead Supervisor.

(2) Foreman: Provide a full time Foreman to directly supervise and direct no more than 10 lead workers. Each Foreman will act as the Competent Person for the workers the foreman is directing. The Foreman has oversight authority over the workers and reports to the General Superintendent. If there are 10 or fewer abatement workers

on the project the General Superintendent may fill the Foreman's position. Shall be CDPH certified as a Lead Supervisor.

(3) Experience and Training: The General Superintendent and foreman shall meet all the training requirements as a Supervisor in accordance with Title 17, California Code of Regulations, Division 1, Chapter 8. They shall also have experience with projects of similar types and sizes.

(4) Workers: All abatement workers shall have current certifications as a Lead Worker in accordance with Title 17, California Code of Regulations, Division 1, Chapter 8.

(5) Certificate of Worker's Acknowledgment: Submit an original signed copy of the Certificate of Worker's Acknowledgment found in Appendix A of this section, for each worker and supervisor who is to be at the job site or enter the Work Area.

b) Identify state licensed transporter, disposal location, and associated permits for all hazardous waste.

c) Submit respiratory protection information and air monitoring data as per the following:

(1) Operating Instruction: Submit complete operating and maintenance instructions for all components and systems as a whole. Submittal is to be in bound manual form suitable for field use.

(2) Respiratory Protection Program: Submit ABATEMENT CONTRACTOR's written respiratory protection program manual as required by 8 CCR 1531 and 5144.

(3) Respiratory Protection Schedule: Submit level of respiratory protection intended for each operation required by the project.

(4) Copies of current respirator fit test: Fit tests must be performed every 6 months.

d) Submit doctor's report from medical examination conducted within the last 12 months as part of compliance with OSHA medical surveillance requirements for each worker who is to enter the Work Area. Submit, at a minimum, the following for each worker:

(1) Name and Social Security Number

(2) Copies of Blood Lead Levels and Zinc Protoporphyrin tests

(3) Physicians Written Opinion from examining physician including at a minimum the following:

(a) Whether worker has any detected medical conditions that would place the worker at an increased risk of material health impairment from exposure to lead. Any recommended limitations on the worker or on the use of personal protective equipment such as respirators.

(b) Statement that the worker has been informed by the physician of the results of the medical examination and of any medical conditions that may result from lead exposure.

e) Submit a notarized certification, signed by an officer of the ABATEMENT CONTRACTOR firm that exposure measurements, medical surveillance, and worker training records are being kept in conformance with 8 CCR 1529.

f) Identify the laboratory that will be performing the analysis of the personal samples and provide their accreditation. Also discuss the method by which the ABATEMENT CONTRACTOR will provide the analytical results to the PROJECT MONITOR within 24 hours of sampling completion.

4. Submit the following during and at the completion of the work

a) Copies of all Waste Shipment Records

b) Copies of all air monitoring results within 24 hours

5. At the end of a project, the ABATEMENT CONTRACTOR shall submit the following to the PROJECT MONITOR:

a) Personal Air Sample Results

b) Copies of Project Daily Logs

c) Containment Entry/Exit Logs

d) Waste Disposal Documentation

e) Certificate of Visual Inspection

E. SCHEDULES AND REPORTS

1. Prior to each phase of project, the ABATEMENT 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.

F. PRODUCT DATA

1. The ABATEMENT CONTRACTOR shall submit product information that is to be used during the abatement activities prior to commencement of work (i.e., encapsulants). General information required includes manufacturer's standard printed recommendations for application and use, compliance with recognized standards of trade association and testing agencies, and safety data sheets (SDSs).

2. Polyethylene sheet

a) A single polyethylene film in the largest sheet size possible to minimize seams, 4.0 or 6.0 mil thick as indicated, and clear, frosted, or black as indicated.

b) Provide flame resistant polyethylene film that conforms to requirements set forth by the National Fire Protection Association Standard 701, Small Scale Fire Test for Flame-resistant Textiles and Films. Provide largest size possible to minimize seams, 4.0 or 6.0 mil thick as indicated, and frosted or black as indicated.

c) Reinforced Polyethylene Sheet: Where plastic sheet is the only separation between the Work Area and building exterior, provide translucent, nylon reinforced, laminated, flame resistant, polyethylene film that conforms to requirements set forth by the National Fire Protection Association Standard 701, Small Scale Fire Test for Flame-resistant Textiles and Films. Provide largest size possible to minimize seams, 4.0 or 6.0 mil thick as indicated, frosted or black as indicated.

3. Tape

a) Provide duct tape in 2" or 3" widths as indicated, with an adhesive which is formulated to stick aggressively to sheet polyethylene.

4. Spray adhesive

a) Provide spray adhesive in aerosol cans which is specifically formulated to stick tenaciously to sheet polyethylene.

G. PROJECT CLOSE-OUT

1. Upon completion of work and prior to payment, the PROJECT MONITOR will proceed with an initial inspection of the abatement work area. A Certificate of Visual Inspection (Appendix B) will be signed by both the ABATEMENT CONTRACTOR and PROJECT MONITOR. The ABATEMENT CONTRACTOR will not be paid until the area meets the established project-specific clearance criteria and has submitted the required information.

II. DEFINITIONS

A. 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.

B. ABATEMENT CONTRACTOR: The designated sub-contractor performing the required abatement work outlined in this specification.

C. ACCREDITED or ACCREDITATION (when referring to a person or laboratory): A person or laboratory accredited in accordance with section 206 of Title II of the Toxic Substances Control Act (TSCA).

D. ACTION LEVEL: An 8-hour time weighted average (TWA) lead airborne concentration of 30 µg/m3.

E. AIR MONITORING: The process of measuring the lead content of a specific volume of air.

F. AUTHORIZED VISITOR: The Owner, the Owner's Representative, testing lab personnel, the Architect/Engineer, emergency personnel or a representative of any federal, state and local regulatory or other agency having authority over the project.

G. BARRIER: Any surface that seals off the work area to inhibit the movement of dust.

H. BREATHING ZONE: A hemisphere forward of the shoulders with a radius of approximately 6 to 9 inches.

I. CONTAINMENT: A process for protecting both workers and environment by controlling exposures to lead dust and debris created during abatement.

J. CONTAMINATE: Refers to lead-containing dust/debris.

K. DEMOLITION: The wrecking or taking out of any building component, system, finish or assembly of a facility together with any related handling operations.

L. DISPOSAL BAG: A properly labeled 6 mil thick leak tight plastic bags used for transporting lead waste from work site to disposal site.

M. 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.

N. 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.

O. 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.

P. 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.

Q. HIGH PHOSPHATE DETERGENT: Detergent which contains at least 5% tri sodium phosphate.

R. LEAD: Means metallic lead, all inorganic lead compounds, and organic lead soaps.

S. LEAD-BASED PAINT (LBP): For purposes of this project, LBP refers to the materials identified in these specifications as having paint or coatings that contains lead.

T. 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.

U. 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.

V. 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.

W. OWNER: Refers to the City of San Diego

X. 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.

Y. PAINT REMOVAL: A strategy of abatement which entails removing lead based paint form 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.

Z. PERMISSIBLE EXPOSURE LIMIT (PEL): An 8-hour TWA lead airborne concentration of 50 µg/m3.

AA. PERSONAL MONITORING: Sampling of contaminant concentrations within the breathing zone of an employee.

BB. PROJECT MONITOR: City of San Diego Asbestos & Lead Management Program staff or their designated consultant.

CC. 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.

DD. 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.

EE. 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.

FF. RESPIRATOR: A device designed to protect the wearer from the inhalation of harmful contaminants.

GG. TESTING LABORATORIES: A "testing laboratory" is an entity engaged to perform specific inspections or tests at the project site or elsewhere, to report on, and if required, to interpret results of those inspections or tests.

HH. TIME-WEIGHTED AVERAGE (TWA): The average concentration of a contaminant in air during a specific time period.

II. 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)].

JJ. 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.

KK. 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.

III. SITE WORK

A. INTRODUCTION

This portion of the specification describes procedures and protocols for abatement 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.

B. BACKGROUND INFORMATION

Sampling of building materials 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. The ABATEMENT CONTRACTOR shall visit the project site and verify the location and quantities of the lead containing materials that will be removed under the terms and conditions of the contract and this specification

C. GENERAL INFORMATION

1. Potential Hazards

a) The disturbance of lead containing materials 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. The procedures and methods described herein must be followed and the ABATEMENT CONTRACTOR must comply with all applicable federal/state/local requirements.

2. Stop Work

a) If the PROJECT MONITOR presents a verbal or written stop work order, the ABATEMENT CONTRACTOR shall immediately and automatically stop all work. Recommencement of the work may not begin until authorized by the PROJECT MONITOR.

D. PROJECT ADMINISTRATION

1. Certified Supervisor

The ABATEMENT CONTRACTOR needs to provide a full-time lead abatement supervisor who is experienced in administration and supervision of lead abatement projects including work practices, protective measures for building and personnel, disposal procedures, etc. This supervisor must have a current CDPH Lead Supervisor certificate. This person will act as the competent person on the job.

In addition, all employees working on the project must have current CDPH Lead Worker certification.

E. SPECIAL REPORTS

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 ABATEMENT 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.

2. Reporting Accidents

The ABATEMENT 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.

F. COMPLIANCE WITH CODES AND REGULATIONS

1. Except to the extent that more explicit, or more stringent requirements are written directly into this Abatement 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.

2. The ABATEMENT 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 ABATEMENT CONTRACTOR shall hold the City and its representative harmless for the ABATEMENT 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,

3. State requirements which govern lead hazard control activities or hauling and disposal of hazardous waste include, but are not limited to, the following:

a) California Occupational Safety and Health Administration (Cal/OSHA):

(1) Division of Industrial Safety; Chapter 4

(2) 8CCR, Section 1532.1, Lead in Construction

(3) 8CCR, Section 5194, Hazard Communication Standard

(4) 8CCR, Section 1531, Construction Respiratory Protection Standard

(5) 8CCR, Section 1514, Construction Personal Protective Equipment

(6) 8CCR, Section 1509, Construction Injury Illness Prevention Program

(7) 8CCR, Section 6003-4, Accident Prevention Signs and Tags

(8) 8CCR, Section 3204, Access to Employee Exposure Medical Records

b) California Environmental Protection Agency (Cal/EPA):

(1) 22CCR, Division 4.5, Environmental Health Standards for the Management of Hazardous Waste.

c) California Department of Public Health (CDPH):

(1) 17CCR, Division 1, Chapter 8, Accreditation of training providers and interim certification of individuals engaged in lead-related construction work.

4. Federal requirements which govern lead hazard control activities or hauling and disposal of hazardous waste include, but are not limited to, the following:

a) Federal Environmental Protection Agency (FED/EPA):

(1) Hazardous Waste Standards, 40 Code of Federal Regulations (CFR), Part 261

(2) EPA Renovate, Repair, Painting (RRP), 40 CFR 745, Subpart E.

b) U.S. Department of Transportation (DOT):

(1) Hazardous Substances, 49CFR, Parts 171 though 180

c) American National Standards Institute, Inc. (ANSI):

(1) Z9.2-79 Fundamentals Governing the Design and Operation of Local Exhaust

(2) Z88.2-80 Practices of Respiratory Protection

d) Department of Housing and Urban Development (HUD):

(1) Guidelines for the Evaluation and Control of Lead Based Paint Hazards in Housing (most current draft or final copy)

5. In addition, the ABATEMENT 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.

6. Local requirements which govern lead hazard control activities include, but are not limited to, the following:

a) Air Pollution Control District (APCD) - San Diego County

(1) APCD Rules and Regulations, Rule 51 (Public Nuisance), Rule 10-11 (permitting of equipment)

b) San Diego Municipal Code §54.1001 etc. seq.

(1) Prevents, identifies and remedies lead hazards within the City of San Diego

G. PERMITS AND LICENSES

The ABATEMENT CONTRACTOR shall submit to the City in the bid submittal any permits or licenses necessary to carry out this work.

1. 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).

2. Licenses

The ABATEMENT 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.

H. HEALTH AND SAFETY

This section describes the equipment and procedures required for protecting workers from Lead contamination and other workplace hazards.

1. Provide worker protection as required by the most stringent OSHA and/or EPA standards applicable to the work.

2. Training

a) ABATEMENT CONTRACTOR workers shall be trained in accordance with 8CCR, Section 1532.1 (lead). In addition, workers and supervisors must be lead-trained and have certification for lead-related work from the California Department of Public Health (CDPH).

b) 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 additional, 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.

c) 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.

d) 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. Protective clothing

a) Coveralls: Provide disposable "full body" coveralls and disposable head covers, and require that they be worn at all times by all workers in the Work Area. Provide a sufficient number for all required changes, for all workers in the Work Area.

b) Boots: Provide work boots with non-skid soles, and where required by OSHA, foot protection for all workers. Provide boots at no cost to workers. Do not allow boots to be removed from the Work Area for any reason, after being contaminated with lead containing material. Thoroughly clean, decontaminate and bag boots before removing them from Work Area at the end of the work.

c) Hard Hats: Provide head protection (hard hats) as required by OSHA for all workers, and provide 1 spare for use by Owner's Representative, Project Administrator, and Owner. Require hard hats to be worn at all times that work is in progress that may potentially cause head injury. Provide hard hats of the type with plastic strap suspension. Require hats to remain in the Work Area throughout the work. Thoroughly clean, decontaminate and bag hats before removing them from Work Area at the end of the work.

d) Goggles: Provide eye protection (goggles) as required by OSHA for all workers involved in scraping, spraying, or any other activity which may

potentially cause eye injury. Thoroughly clean, decontaminate and bag goggles before removing them from Work Area at the end of the work.

e) Gloves: Provide work gloves to all workers and require that they be worn at all times in the Work Area. Do not remove gloves from Work Area and dispose of as lead contaminated waste at the end of the work.

4. Respirators

a) Air Purifying Respirators

(1) Respirator Bodies: Provide half face or full face type respirators based upon appropriate protection factor as determined by the ABATEMENT CONTRACTORS competent person. .

(2) Filter Cartridges: Provide, at a minimum, HEPA type filters labeled with NIOSH and MSHA Certification for "Radionuclides, Radon Daughters, Dust, Fumes, Mists including Lead Containing Dusts and Mists" and color coded in accordance with ANSI Z228.2 (1980). In addition, a chemical cartridge section may be added, if required, for solvents, etc., in use. In this case, provide cartridges that have each section of the combination canister labeled with the appropriate color code and NIOSH/MSHA Certification.

(3) Non permitted respirators: Do not use single use, disposable or quarter face respirators.

(4) Require that respiratory protection be used at all times when there is any possibility of disturbance of lead containing or other hazardous materials whether intentional or accidental.

(5) Require that a respirator be worn by anyone in a Work Area at all times, regardless of activity, during a period that starts with any operation which could cause airborne dust until the area has been cleared for re occupancy.

(6) Regardless of Airborne Levels: Require that the minimum level of respiratory protection used will be half-face air purifying respirators with high efficiency filters.

b) Fit testing

(1) Initial Fitting: Provide initial fitting of respiratory protection during a respiratory protection course of training. Only allow an individual to use respirators for which training and fit testing has been provided.

(2) Upon Each Wearing: Require that each time an air purifying respirator is put on it be checked for fit with a positive and negative pressure fit check in accordance with the manufacturer's instructions or ANSI Z88.2 (1980).

c) Respirators, disposable coveralls, head covers, and foot covers shall be provided by the ABATEMENT CONTRACTOR for the City of San Diego's Asbestos and Lead Management Program's PROJECT MONITOR, and other authorized representatives who may inspect the job site. Provide two (2) respirators and six (6) complete coveralls and, where applicable, six (6) respirator filter changes per day.

5. Materials and Equipment

a) Only material and equipment that are recognized as being suitable for the intended use, by compliance with appropriate standards, may be used.

6. Water Service

a) The ABATEMENT 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.

7. Electrical Services

a) The ABATEMENT 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 ABATEMENT CONTRACTOR shall provide their own electrical hook-ups, i.e. spider boxes, ground fault circuit interrupter (GFCI) etc. and installed by a licensed electrician.

b) 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.

8. Sanitary Facilities

a) The ABATEMENT CONTRACTOR shall provide sanitary facilities on-site if none have been made available by the City.

9. Fire Extinguisher

a) 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.

10. First Aid

a) The ABATEMENT CONTRACTOR will need to provide first aid supplies which should comply with the governing regulations and recognized recommendations within the construction industry.

I. WORK AREA PROCEDURES

1. 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.

2. Require that workers NOT eat, drink, smoke, chew tobacco or gum, or apply cosmetics in the Work Area.

3. ABATEMENT CONTRACTOR shall secure work area from access by public, staff or users of the area. Accomplish this where possible, by locking doors, gates, or other means of access to the area.

4. Barricade fencing is required for securing an outside area from unauthorized access. Work area delineation shall occur at no less then twelve feet (12') from the radius of the work and/or building. Yellow caution tape shall not be used.

5. All windows, vents, mechanical systems, etc., in close proximity to the abatement area shall be sealed with plastic and tape by the ABATEMENT CONTRACTOR prior to the work beginning.

6. Warning signs for lead shall be posted as per 8CCR, Section 1532.1(m).

7. A visitor entry and exit-log, and an employee daily sign-in log will be maintained throughout the lead hazard control activities. The ABATEMENT CONTRACTOR shall be responsible for the project site security during the operations in order to protect work efforts and equipment.

J. REMOVAL OF LEAD CONTAINING MATERIALS

1. Lead containing materials shall be adequately wetted with water or a removal encapsulant before and during removal process, to reduce dust emission.

2. The ABATEMENT CONTRACTOR should exercise caution in using water, as he will be solely responsible for any water damage to the facility resulting from the work.

3. ABATEMENT CONTRACTOR is responsible for keeping all hazardous debris within the containment area at all times throughout removal. Any interior contamination, if created, is the responsibility of the ABATEMENT CONTRACTOR to clean with no additional cost to this contract.

4. ABATEMENT CONTRACTOR shall ensure there is no loose debris around the Work Area during the removal and if found, ABATEMENT CONTRACTOR shall clean the area immediately.

K. CLEANING

1. Daily cleaning includes removing large and small debris, HEPA vacuuming horizontal surfaces, wet mopping, and then HEPA vacuuming horizontal surfaces, and possible exterior cleaning.

2. 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.

3. Additional cleaning cycles may be necessary for porous surfaces, and difficult to clean surfaces (crevices). Failure to meet clearance criteria will require additional cleaning.

L. DECONTAMINATION PROCEDURE

1. Prior to leaving the Work Area, HEPA vacuum outer suit completely and remove, turning it inside out while doing so.

2. Proceed to decontamination area where the second suit is to be removed while turning it inside out.

3. After wiping all areas and respirator, remove respirator and wipe facial area clean.

4. Place contaminated suits, towels, and respirator cartridges in a properly labeled waste containers.

5. At the completion of the project, boots, hard hats, and goggles should be decontaminated and bagged prior to removal from the Work Area.

6. Equipment leaving the Work Area should be HEPA vacuumed and wet wiped.

M. CLEARANCE

1. Clearance must be performed by a California Department of Public Health (CDPH) Certified Lead PROJECT MONITOR. It will not be performed by the ABATEMENT CONTRACTOR (although the ABATEMENT CONTRACTOR may 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).

a) Visual Examination for Determination of Completed Work:

(1) 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 ABATEMENT

CONTRACTOR will be asked to re-clean prior to samples being collected.

(2) 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 competed form should be submitted to the City at the end of the project.

2. Environmental Sampling:

a) 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		
(1)	Interior Floors	40 µg/ft2
(2)	Interior Window Sills	250 µg/ft2
(3)	Exterior Horizontal Surfaces	400 µg/ft2
(4)	Exterior Soil*	1000 µg/ft2
(5)	Soil in Play Areas*	400 µg/ft2

b) Re-cleaning, at the Contractor's expense, will be required for surfaces that do not pass clearance criteria.

c) 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.

* Soil may not be impacted as a part of the proposed work but if contamination occurs then levels shall be used for clearances. ABATEMENT CONTRACTOR may take background soil samples to determine the preexisting soil conditions.

N. TRANSPORTATION AND DISPOSAL

1. Waste minimization

a) The ABATEMENT CONTRACTOR is required to make all reasonable efforts to minimize the amount of hazardous waste generated from this project.

2. Waste characterization

a) The ABATEMENT 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. Pre-transportation requirements

a) 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.

b) 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.

c) 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.

4. 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.

5. 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.

6. Disposal of the lead related hazardous wastes shall be by incineration unless otherwise specified by the ALMP.

APPENDIX A

CERTIFICATE OF 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 licensed by the California Department of Public Health for Lead Hazard Control 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:

_____

_____

_____

_____

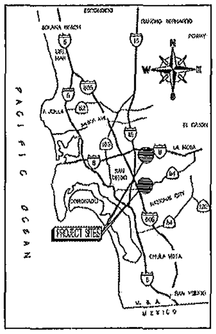
APPENDIX C

SUMMARY OF LEAD CONTAINING MATERIALS

READING	COMPONENT	LOCATION	SUBSTRATE	COLOR	PBC	UNITS
31	Rafters	Storage House	Wood	White	3.4	mg/cm^2
33	Doors and Frames	Storage House	Wood	Blue	.8	mg/cm^2
34	Windows and Frames	Storage House	Wood	Brown	1.5	mg/cm^2
35	Windows and Frames	Storage House	Wood	Green	1.7	mg/cm^2

The remainder of this page is intentionally left blank.

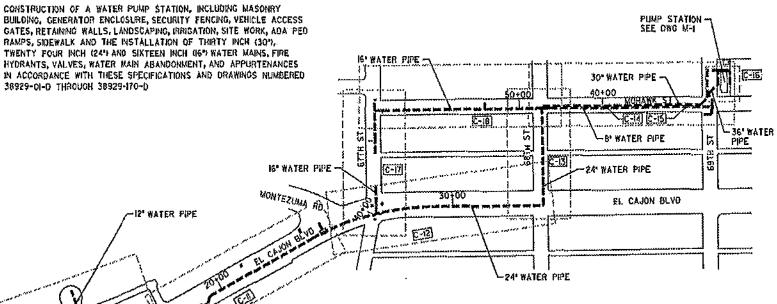
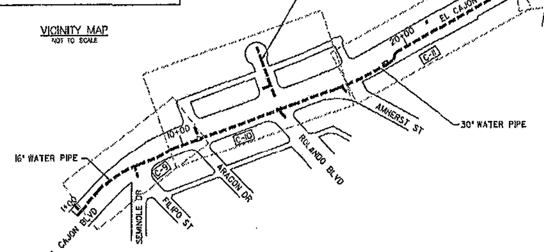
69TH AND MOHAWK PUMP STATION

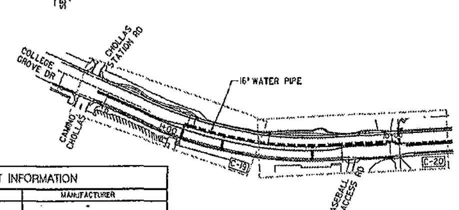


VICINITY MAP
NOT TO SCALE

WORK TO BE DONE

CONSTRUCTION OF A WATER PUMP STATION, INCLUDING MASONRY BUILDING, GENERATOR ENCLOSURE, SECURITY FENCING, VEHICLE ACCESS GATES, RETAINING WALLS, LANDSCAPING, IRRIGATION, SITE WORK, ADA PED RAMPS, SIDEWALK AND THE INSTALLATION OF THIRTY INCH (30"), TWENTY FOUR INCH (24") AND SIXTEEN INCH (16") WATER MAINS, FIRE HYDRANTS, VALVES, WATER MAIN ABANDONMENT, AND APPURTENANCES IN ACCORDANCE WITH THESE SPECIFICATIONS AND DRAWINGS NUMBERED 38929-01-D THROUGH 38929-170-D



CONSTRUCTION STORM WATER PROTECTION NOTES

1. TOTAL SITE DISTURBANCE AREA (ACRES) 0.72
   HYDROLOGIC UNIT/ WATERSHED SAN DIEGO RIVER
   HYDROLOGIC SUBAREA NAME & NO. LOWER SAN DIEGO 907.11
2. THE CONTRACTOR SHALL COMPLY WITH THE REQUIREMENTS OF THE
   - ☒ WPCP
     THE PROJECT IS SUBJECT TO MUNICIPAL STORM WATER PERMIT NO. R9-2013-0001 AS AMENDED BY R9-2015-0001 AND R9-2015-0100
   - ☐ SWPPP
     THE PROJECT IS SUBJECT TO MUNICIPAL STORM WATER PERMIT NO. R9-2013-0001 AS AMENDED BY R9-2015-0001 AND R9-2015-0100 AND CONSTRUCTION GENERAL PERMIT ORDER 2009-0009-DWQ AS AMENDED BY ORDER 2010-0014-DWQ AND 2012-0006-DWQ
     TRADITIONAL: RISK LEVEL 1☐ 2☐ 3☐
     LUP: RISK TYPE 1☐ 2☐ 3☐
3. CONSTRUCTION SITE PRIORITY
   ☐ ASBS ☐ HIGH ☐ MEDIUM ☒ LOW

GENERAL NOTES

1. MOHAWK PUMP STATION WILL BE LCATED AT THE SAME LOCATION AS THE ABANDONED PUMP STATION. THIS PARCEL OF LAND, OWNED BY THE CITY OF SAN DIEGO IS LOCATED AT 6910 MOHAWK STREET, SAN DIEGO CA 92115, AT THE NORTHEAST CORNER OF 69TH STREET AND MOHAWK STREET. THE EXISTING STRUCTURES IN THIS LOT MUST BE DEMOLISHED PRIOR TO ANY CONSTRUCTION.

LEGEND

IMPROVEMENTS	STANDARD DRAWINGS	SYMBOL
TRENCH RESURFACING	SDG-107, TYPE A	
CUTTING AND PLUGGING ABANDONED WATER MAIN	WP-03	
CITY BENCH MARK (BM)		
WATER MAIN & APPURTENANCES	SDW-110, SDW-148, SDW-151, SDW-161	
VALVES WITH CAPS AND WELLS	SDW-109, SDW-152, SDW-153, WV-05	
FIRE SERVICE CONNECTION & ASSEMBLY	SDW-109, SDW-118, SDW-148, SDW-152, SDW-153	F
6" FIRE HYDRANT ASSEMBLY & MARKER 2-PORT UNLESS SPECIFIED AS 3-PORT	SDW-104, SDW-109, SDW-148, SDW-152, SDW-153	
1" AND 2" WATER SERVICE UNLESS OTHERWISE SPECIFIED	SDW-107, SDW-134, SDW-135 SDW-136, SDW-137, SDW-138, SDW-148, SDW-149, SDW-150, WS-03	W
BLOW-OFF ASSEMBLY	SDW-143, SDW-144, SDW-145, SDW-146, SDW-148	
AIR & VACUUM VALVE	SDW-117, SDW-148, SDW-159 SDW-160	
CATHODIC PROTECTION TEST STATION	DETAILS ON CP-1, CP-2	
WROUGHT IRON FENCE		
RETAINING WALL		
CONCRETE		
DECOMPOSED GRANITE		
DRIVEWAY		
MAJOR CONTOUR		470
MINOR CONTOUR		
RIDGE LINE		
SIDE WALK, CURB, GUTTER		
FLOW LINE GRADE		1.5%
PREFORATED PIPE		
SPOT ELEVATION		x456.56

EXISTING STRUCTURES

- EX WATER MAIN & VALVES
- EX WATER METER
- EX FIRE HYDRANT
- EX WATER MAIN TO BE ABANDONED IN PLACE AND SLURRY FILL, U.N.O.
- EX SEWER MAIN & MANHOLES
- EX DRAINS
- EX PAVEMENT (PROFILE)
- EX GROUND LINE (PROFILE)
- EX TRAFFIC SIGNAL — TS
- EX STREET LIGHT — SL
- EX UNDERGROUND TRAFFIC CONDUIT
- GAS MAIN
- ELEC. COND., TEL. COND., CATV — E T C
- RAILROAD, TROLLEY TRACKS
- EX MINOR CONTOUR
- EX MAJOR CONTOUR — 470

*FOR ADDITIONAL SYMBOLS SEE RESURFACING, CURB RAMP, HORIZONTAL ALIGNMENT COORDINATE AND TRAFFIC CONTROL SHEETS.

G-1

AS-BUILT INFORMATION

MATERIALS	MANUFACTURER
PIPE CL 235 (WATER)	-
PIPE SDR 35 (SEWER)	-
GATE VALVES	-
FIRE HYDRANTS	-
SEWER MANHOLES	-
REHABILITATE SEWER MANHOLES	-
REHABILITATE SEWER MAIN	-

FIELD DATA

BENCHMARKS: NWBP SARANAC ST AND 69TH ST ELEV. 460.779 MSL BASED ON NGVD 29 FEET AS SHOWN IN THE CITY OF SAN DIEGO BENCH BOOK.
FIELD NOTES: PER DAVIS/WATKINS

DECLARATION OF RESPONSIBLE CHARGE

I HEREBY DECLARE THAT I AM THE ENGINEER OF WORK FOR THIS PROJECT THAT I HAVE EXERCISED RESPONSIBLE CHARGE OVER THE DESIGN OF THE PROJECT AS DEFINED IN SECTION 6703 OF THE BUSINESS AND PROFESSIONS CODE AND THAT THE DESIGN IS CONSISTENT WITH CURRENT STANDARDS. I UNDERSTAND THAT THE CHECK OF PROJECT DRAWINGS AND SPECIFICATIONS BY THE CITY OF SAN DIEGO IS CONFINED TO A REVIEW ONLY AND DOES NOT RELIEVE ME, AS ENGINEER OF WORK, OF MY RESPONSIBILITIES FOR PROJECT DESIGN.

JOHN H. HARRIS RCE 38217 — AUGUST 15, 2016 — DATE

69TH AND MOHAWK PUMP STATION
TITLE SHEET 1
KEY MAP GENERAL NOTES

CITY OF SAN DIEGO, CALIFORNIA
PUBLIC WORKS DEPARTMENT
SHEET 01 OF 170 SHEETS

WATER S-12011
SPEC NO. 1401
JOHN STOHR
PROJECT MANAGER

DESCRIPTION	BY	APPROVED	DATE	FILMED
ORIGINAL	MH			
ADDENDUM B			11/23/16	

38929-01-D

CONSTRUCTION CHANGE / ADDENDUM

CHANGE	DATE	AFFECTED OR ADDED SHEET NUMBERS	APPROVAL NO.
B	11/22/16	C-10, C-11, C-22, C-25, C-26, E-3, E-6, E-8 E-13 AND E-14	

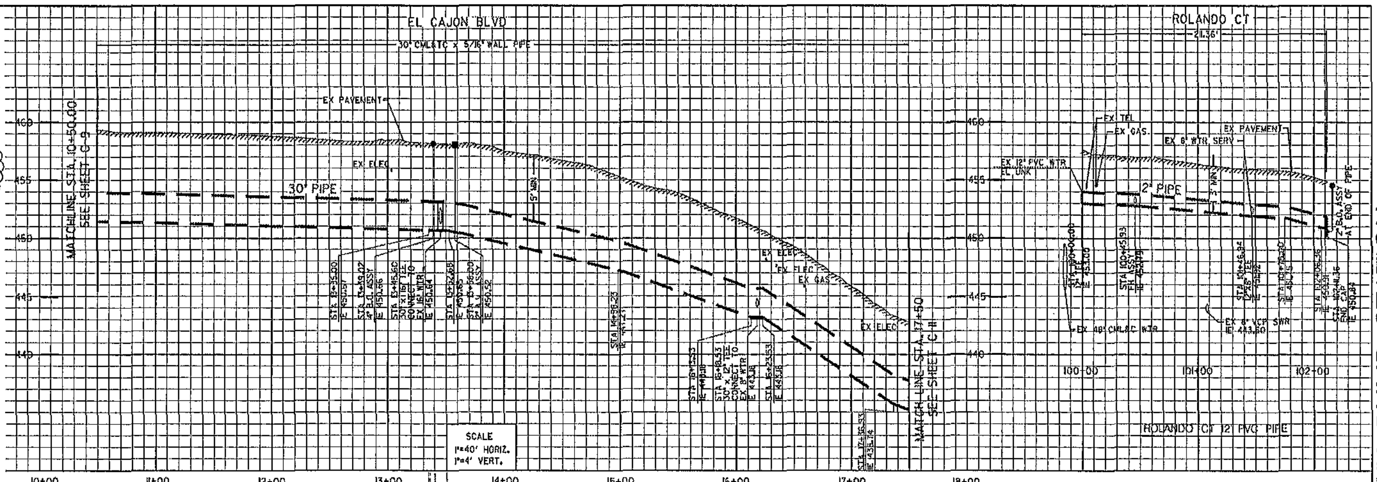
WARNING
IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE.

CITY OF SAN DIEGO
PUBLIC WORKS PROJECT

Michael Baker
INTERNATIONAL
9755 Clairemont Mesa Blvd., San Diego, CA 92124
Phone: (858) 614-5000 • MBAKERINTL.COM

ADDENDUM B

69TH AND MOHAWK PUMP STATION



① BY CONTRACTOR FURNISH & INSTALL:
STA 13+39.02
1-4" B.O. ASSY RT

② BY CONTRACTOR FURNISH & INSTALL: ⚠
STA 13+45.60
1-30" x 16" TEE (F),
2-30" BFV (F) BK, AHD,
1-16" BFV (F, MJ) RT,
1-4" BYPASS,
12' 16" PVC WTR RT,
1-16" 22.5° BEND (MJ) 12' RT,
36' 16" PVC WTR PIPE RT,
SEE DETAIL C, DWG C-25
(10)

③ BY CONTRACTOR FURNISH & INSTALL:
STA 13+58.00
1-2" A.V. ASSY RT

④ BY CONTRACTOR CUT & PLUG:
STA 13+45.60 44' RT,
EX 16" AC WTR
RECONNECT AFTER
NEW MAIN HAS BEEN
ACCEPTED

⑤ BY CONTRACTOR FURNISH & INSTALL:
STA 16+18.53
1-30" x 12" TEE (W, F, F)
1-30" BFV (F) AHD,
1-12" GV (F, MJ) RT,
14' 12" PVC WTR PIPE RT,
1-12" 45° BEND (MJ) 15' RT,
1-12"x8" RED (MJ) RT,
14' 8" PVC WTR PIPE RT,
SEE DETAIL D, DWG C-25
(13)

⑥ BY CONTRACTOR CUT & PLUG:
STA 16+18.53 28' RT,
EX 8" AC WTR
RECONNECT AFTER
NEW MAIN HAS BEEN
ACCEPTED

⑦ BY CONTRACTOR FURNISH & INSTALL:
STA 14+50.00 TO 16+50.00
ABANDON 200' OF
EX 16" CI WTR,
SLURRY FILL
AFTER NEW MAIN
HAS BEEN ACCEPTED

⑧ BY CONTRACTOR FURNISH & INSTALL:
STA 17+25.00
2-WIRE TEST STATION W/
3 ANODES, SEE DETAIL I,
DWG CP-1

⑨ BY CONTRACTOR FURNISH & INSTALL:
STA 100+00.00
1-12" TEE CUT-IN (F)
2-12" GV (F, MJ) LT, AHD
(67)

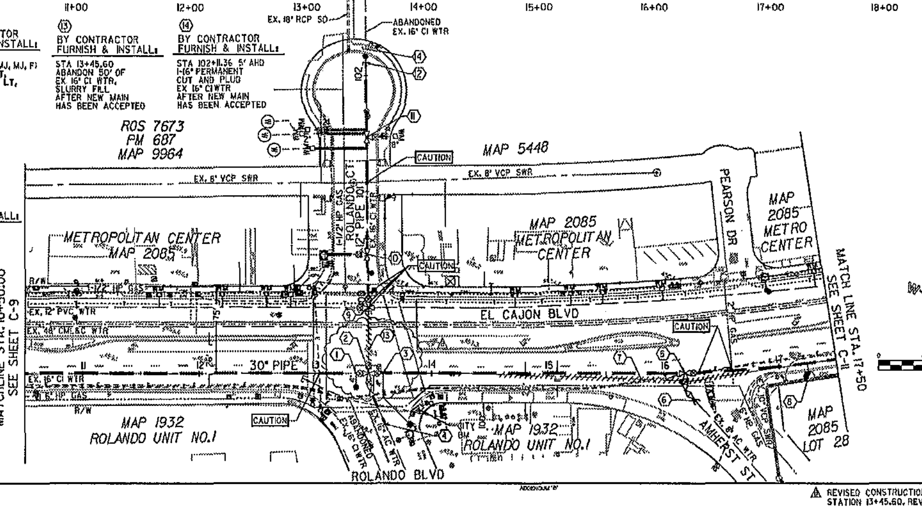
⑩ BY CONTRACTOR FURNISH & INSTALL:
STA 100+45.93
1-12"x6" TEE (F)
1-6" FH ASSEMBLY & MARKER
3 PORT, 36' LT
(68)

⑪ BY CONTRACTOR FURNISH & INSTALL:
STA 101+46.94
1-12" x 8" TEE (MJ, MJ, F)
1-8" GV (F,MJ) LT,
36' 8" PVC PIPE LT,
RECONNECT TO
EX 8" FIRE
SERVICE ASSY
(69)

⑫ BY CONTRACTOR FURNISH & INSTALL:
STA 102+11.36
PERMANENT
1-12" END CAP W/
2" B.O. ASSY
(70)

⑬ BY CONTRACTOR FURNISH & INSTALL:
STA 13+45.60
ABANDON 50' OF
EX 16" CI WTR,
SLURRY FILL
AFTER NEW MAIN
HAS BEEN ACCEPTED

⑭ BY CONTRACTOR FURNISH & INSTALL:
STA 102+11.36 5' AHD
1-16" PERMANENT
CUT AND PLUG
EX 16" CIWTR
AFTER NEW MAIN
HAS BEEN ACCEPTED



REFERENCE:
WATER: WD-596, 3840-W, 4074-L, 11456-D, 11458-D, 11701-D, 12251-L, 27727-D, 33123-D
SEWER: 12684-D
STORM DRAIN:
GAS: SDG&E GAS MAP: 16222-118945
ELECTRIC: 16222-118945
CABLE TV:
TELEPHONE: LMI302DA
IMPROVEMENTS: 510-D
100' SCALE/FIELD BOOK: L175
THOMAS BROS.: 1270 2-D
HGL: 645

RETIREMENTS:
16" - CI - 650.00' - 1938
16" - CI - 270.00' - 1948

SCALE 1" = 40'

C-10

69TH AND MOHAWK PUMP STATION

EL CAJON BLVD 30" PIPE &
ROLANDO CT 12" PIPE
ARAGON DR TO AMHERST ST

CITY OF SAN DIEGO, CALIFORNIA
PUBLIC WORKS DEPARTMENT
SHEET 15 OF 170 SHEETS

WATER S-12011

JOHN STOHR
PROJECT MANAGER

DESCRIPTION	BY	APPROVED	DATE	FILMED
ORIGINAL	MN			
⚠ ADDENDUM B			11/22/16	

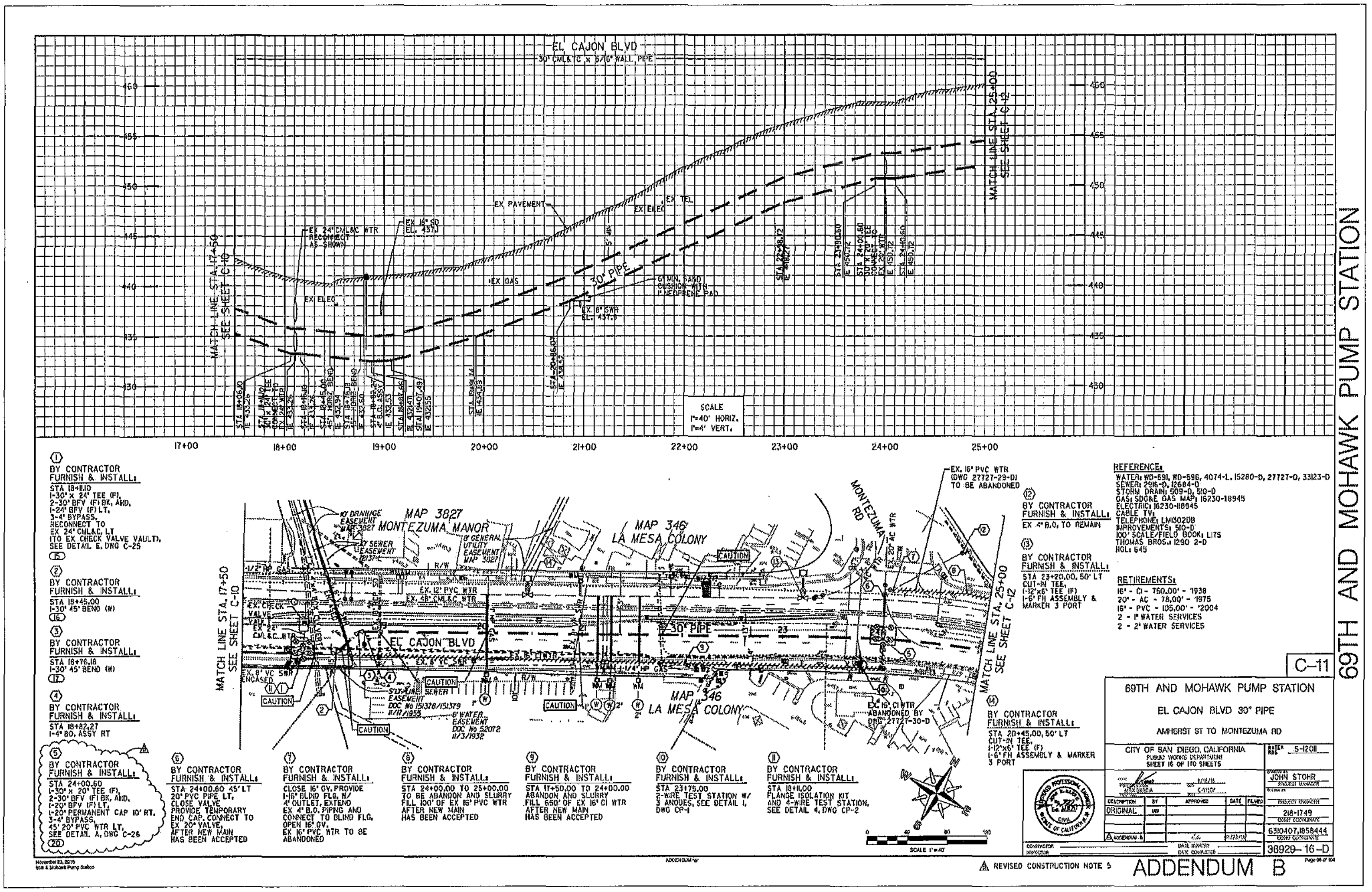
218-1749
6310407-1858444
38929-15-D

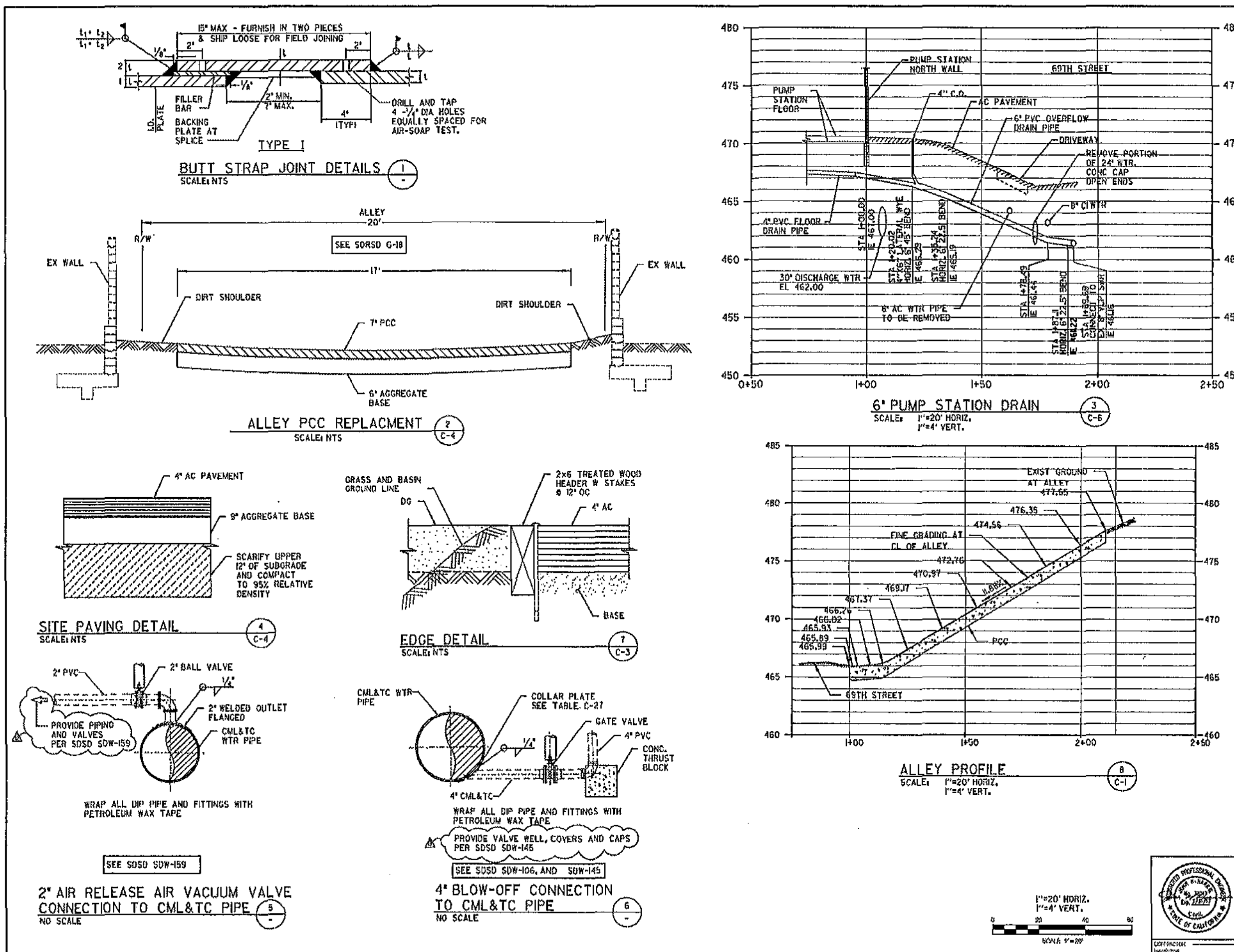
CONTRACTOR ____ DATE STARTED ____
INSPECTOR ____ DATE COMPLETED ____

⚠ REVISED CONSTRUCTION NOTE 2, AND ON STATION 13+45.60, REVISE 4" BYPASS 2 TO 1

ADDENDUM B

69TH AND MOHAWK PUMP STATION


EL CAJON BLVD
30" CML&TC x 5/16" WALL PIPE
MATCH LINE STA. 17+50
SEE SHEET C-10
MATCH LINE STA. 25+00
SEE SHEET C-12
EX PAVEMENT
30" PIPE
SCALE
1"=40' HORIZ.
1"=4' VERT.
17+00
18+00
19+00
20+00
21+00
22+00
23+00
24+00
25+00
1
BY CONTRACTOR
FURNISH & INSTALL:
STA 18+11.10
1-30" x 24" TEE (F),
2-30" BFV (F) BK, AHD,
1-24" BFV (F) LT,
3-4" BYPASS,
RECONNECT TO
EX 24" CML&C, LT
(TO EX CHECK VALVE VAULT),
SEE DETAIL E, DWG C-25
15
2
BY CONTRACTOR
FURNISH & INSTALL:
STA 18+45.00
1-30" 45° BEND (W)
16
3
BY CONTRACTOR
FURNISH & INSTALL:
STA 18+76.18
1-30" 45° BEND (W)
17
4
BY CONTRACTOR
FURNISH & INSTALL:
STA 18+82.27
1-4" BO, ASSY RT
5
BY CONTRACTOR
FURNISH & INSTALL:
STA 24+00.60
1-30" x 20" TEE (F),
2-30" BFV (F) BK, AHD,
1-20" BFV (F) LT,
1-20" PERMANENT CAP 10' RT,
3-4" BYPASS,
45' 20" PVC WTR LT,
SEE DETAIL A, DWG C-26
20
6
BY CONTRACTOR
FURNISH & INSTALL:
STA 24+00.60 45' LT
20" PVC PIPE LT,
CLOSE VALVE
PROVIDE TEMPORARY
END CAP, CONNECT TO
EX 20" VALVE,
AFTER NEW MAIN
HAS BEEN ACCEPTED
7
BY CONTRACTOR
FURNISH & INSTALL:
CLOSE 16" GV, PROVIDE
1-16" BLIND FLG, W/
4" OUTLET, EXTEND
EX 4" B.O. PIPING AND
CONNECT TO BLIND FLG,
OPEN 16" GV,
EX 16" PVC WTR TO BE
ABANDONED
8
BY CONTRACTOR
FURNISH & INSTALL:
STA 24+00.00 TO 25+00.00
TO BE ABANDON AND SLURRY
FILL 100' OF EX 16" PVC WTR
AFTER NEW MAIN
HAS BEEN ACCEPTED
9
BY CONTRACTOR
FURNISH & INSTALL:
STA 17+50.00 TO 24+00.00
ABANDON AND SLURRY
FILL 650' OF EX 16" CI WTR
AFTER NEW MAIN
HAS BEEN ACCEPTED
10
BY CONTRACTOR
FURNISH & INSTALL:
STA 23+75.00
2-WIRE TEST STATION W/
3 ANODES, SEE DETAIL I,
DWG CP-1
11
BY CONTRACTOR
FURNISH & INSTALL:
STA 18+11.00
FLANGE ISOLATION KIT
AND 4-WIRE TEST STATION,
SEE DETAIL 4, DWG CP-2
12
BY CONTRACTOR
FURNISH & INSTALL:
EX 4" B.O. TO REMAIN
13
BY CONTRACTOR
FURNISH & INSTALL:
STA 23+20.00, 50' LT
CUT-IN TEE,
1-12"x6" TEE (F)
1-6" FH ASSEMBLY &
MARKER 3 PORT
14
BY CONTRACTOR
FURNISH & INSTALL:
STA 20+45.00, 50' LT
CUT-IN TEE,
1-12"x6" TEE (F)
1-6" FH ASSEMBLY & MARKER
3 PORT
EX. 16" PVC WTR
(DWG 27727-29-D)
TO BE ABANDONED
EX 16" CI WTR
ABANDONED BY
DWG 27727-30-D
MAP 3827
MONTEZUMA MANOR
MAP 346
LA MESA COLONY
MONTEZUMA RD
EL CAJON BLVD
CAUTION
REFERENCE:
WATER: WD-591, WD-596, 4074-L, 15280-D, 27727-D, 33123-D
SEWER: 2916-D, 12684-D
STORM DRAIN: 509-D, 510-D
GAS: SDG&E GAS MAP: 16230-118945
ELECTRIC: 16230-118945
CABLE TV:
TELEPHONE: LM13020B
IMPROVEMENTS: 510-D
100' SCALE/FIELD BOOK: LITS
THOMAS BROS.: 1290 2-D
HGL: 645
RETIREMENTS:
16" - CI - 750.00' - 1938
20" - AC - 78.00' - 1975
16" - PVC - 105.00' - 2004
2 - 1" WATER SERVICES
2 - 2" WATER SERVICES
SCALE 1"=40'
C-11
69TH AND MOHAWK PUMP STATION
EL CAJON BLVD 30" PIPE
AMHERST ST TO MONTEZUMA RD
CITY OF SAN DIEGO, CALIFORNIA
PUBLIC WORKS DEPARTMENT
SHEET 16 OF 170 SHEETS
WATER S-12011
JOHN STOHR
ORIGINAL
ADDENDUM B
218-1749
6310407,1858444
36929-16-D
REVISED CONSTRUCTION NOTE 5
ADDENDUM B
69TH AND MOHAWK PUMP STATION
November 23, 2015
69th & Mohawk Pump Station



BUTT STRAP JOINT DETAILS
SCALE: NTS
TYPE 1
15" MAX - FURNISH IN TWO PIECES & SHIP LOOSE FOR FIELD JOINING
FILLER BAR
BACKING PLATE AT SPLICE
DRILL AND TAP 4 -1/4" DIA HOLES EQUALLY SPACED FOR AIR-SOAP TEST.
ALLEY PCC REPLACMENT
SCALE: NTS
ALLEY
20'
17'
SEE SDRSD G-18
EX WALL
R/W
DIRT SHOULDER
7" PCC
6" AGGREGATE BASE
SITE PAVING DETAIL
SCALE: NTS
4" AC PAVEMENT
9" AGGREGATE BASE
SCARIFY UPPER 12" OF SUBGRADE AND COMPACT TO 95% RELATIVE DENSITY
EDGE DETAIL
SCALE: NTS
GRASS AND BASIN GROUND LINE
DG
2x6 TREATED WOOD HEADER W STAKES @ 12" OC
4" AC
BASE
2" AIR RELEASE AIR VACUUM VALVE CONNECTION TO CML&TC PIPE
NO SCALE
2" PVC
2" BALL VALVE
2" WELDED OUTLET FLANGED
CML&TC WTR PIPE
PROVIDE PIPING AND VALVES PER SDSD SDW-159
WRAP ALL DIP PIPE AND FITTINGS WITH PETROLEUM WAX TAPE
SEE SDSD SDW-159
4" BLOW-OFF CONNECTION TO CML&TC PIPE
NO SCALE
CML&TC WTR PIPE
COLLAR PLATE SEE TABLE C-27
GATE VALVE
4" PVC
CONC. THRUST BLOCK
4" CML&TC
WRAP ALL DIP PIPE AND FITTINGS WITH PETROLEUM WAX TAPE
PROVIDE VALVE WELL, COVERS AND CAPS PER SDSD SDW-145
SEE SDSD SDW-106, AND SDW-145
6" PUMP STATION DRAIN
SCALE: 1"=20' HORIZ. 1"=4' VERT.
PUMP STATION NORTH WALL
69TH STREET
PUMP STATION FLOOR
4" C.O.
AC PAVEMENT
6" PVC OVERFLOW DRAIN PIPE
DRIVEWAY
REMOVE PORTION OF 24" WTR. CONC CAP OPEN ENDS
4" PVC FLOOR DRAIN PIPE
30' DISCHARGE WTR EL 462.00
8" AC WTR PIPE TO BE REMOVED
ALLEY PROFILE
SCALE: 1"=20' HORIZ. 1"=4' VERT.
EXIST GROUND AT ALLEY
FINE GRADING AT CL OF ALLEY
PCC
69TH STREET

C-22

69TH AND MOHAWK PUMP STATION

DETAILS 2

CITY OF SAN DIEGO, CALIFORNIA
PUBLIC WORKS DEPARTMENT
SHEET 27 OF 110 SHEETS

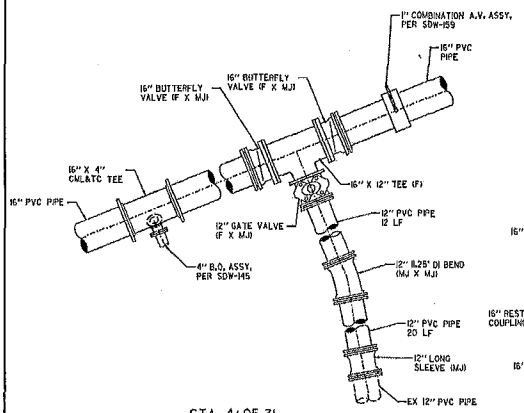
JOHN STOHR

38929-27-D

⚠ ADD STANDARD NOTES ON DETAIL 5 AND 6

ADDENDUM B

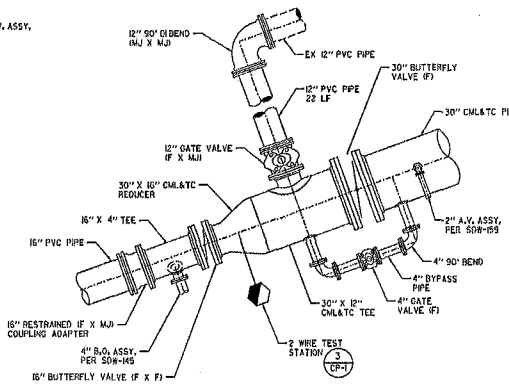
69TH AND MOHAWK PUMP STATION



STA 4+05.31
EL CAJON BLVD AND
SEMINOLE DR AND FILIPO ST

SCALE: 1/2"= 1'-0"

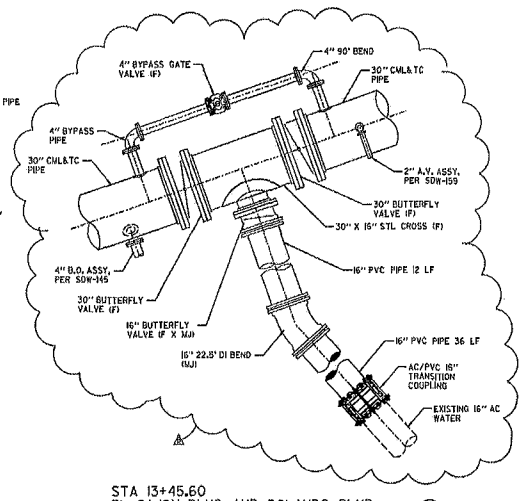
A C-9



STA 6+86.93 = STA 10+00.00
EL CAJON BLVD AND ARAGON DR

SCALE: 1/2"= 1'-0"

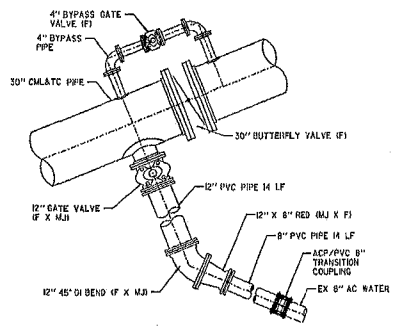
B C-9



STA 13+45.60
EL CAJON BLVD AND ROLANDO BLVD

SCALE: 1/2" = 1'-0"

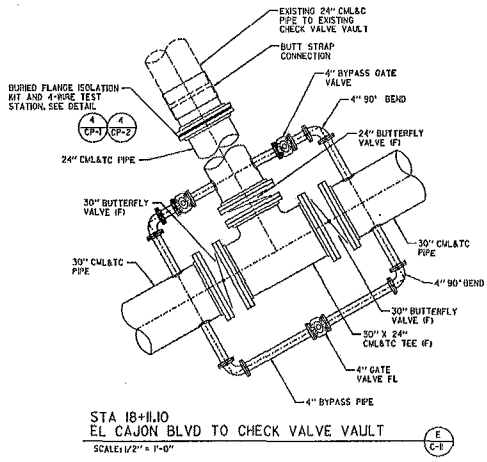
C C-10



STA 16+18.53
EL CAJON BLVD AND AMHERST ST

SCALE: 1/2"= 1'-0"

D C-10



STA 18+11.10
EL CAJON BLVD TO CHECK VALVE VAULT

SCALE: 1/2"= 1'-0"

E C-11

NOTES:
1. BOND ALL NON-INSULATING IN-LINE VALVE, FLANGES, TEES, CROSSES, COUPLINGS AND SPECIALS PER DETAIL 7, SHEET CP-2
2. THRUST BLOCKS NOT SHOWN FOR CLARITY. PROVIDE THRUST BLOCKS FOR ALL FITTINGS AND VALVES PER SDSD SDW-151.
3. WRAP ALL DI FITTINGS AND PIPE SPECIALS WITH PETROLEUM WAX TAPE.

C-25

69TH AND MOHAWK PUMP STATION

69TH AND MOHAWK PUMP STATION

CONNECTION DETAILS 1

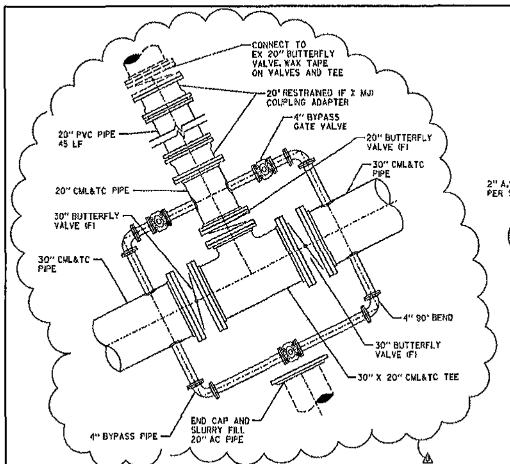
CITY OF SAN DIEGO, CALIFORNIA
ENGINEERING AND CAPITAL PROJECTS DEPARTMENT
SHEET 30 OF 170 SHEETS

WATER 6-1201
MAP
JOHN STOHR
PROJECT MANAGER
DRAWN BY
ENGINEER IN RESPONSIBLE CHARGE
PROJECT ENGINEER
RESIDENT ENGINEER
218-1749
COORD COORDINATE
630407, 1858444
COORD COORDINATE
38929- 30-D

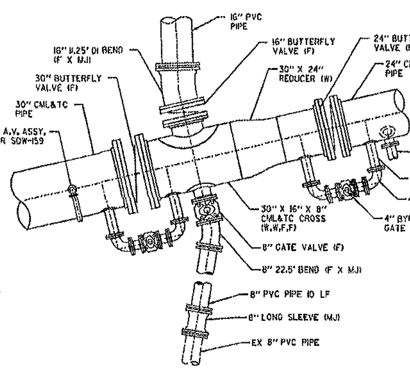
DESCRIPTION	BY	APPROVED	DATE	FILMED
ORIGINAL	MRI			
⚠ ADDENDUM B				

CONSTRUCTION CONTRACTOR
DATE STARTED
INSPECTOR
DATE COMPLETED

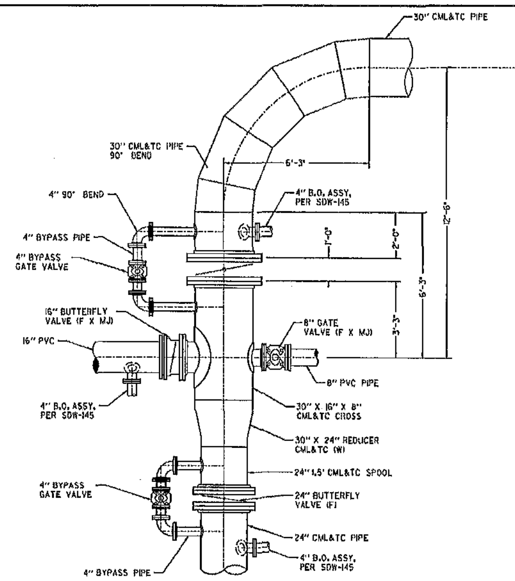
⚠ REVISED DETAIL C ADDENDUM B



STA 24+00.60
EL CAJON BLVD AND MONTEZUMA RD
SCALE: 1/2" = 1'-0"
A / C-11



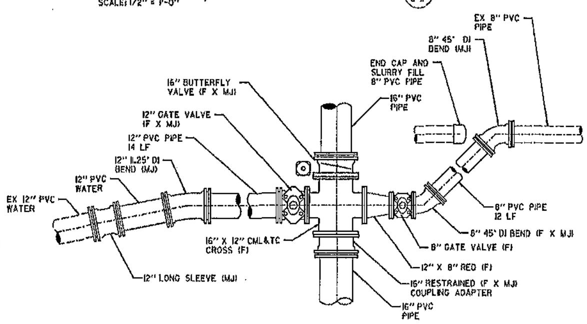
STA 26+23.92 = STA 40+00.00
67TH ST AND EL CAJON BLVD
SCALE: 1/2" = 1'-0"
B / C-12



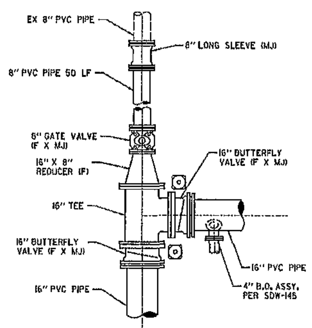
STA 36+87.80 = STA 50+86.29
68TH ST AND MOHAWK ST
SCALE: 1/2" = 1'-0"
C / C-13

NOTES:

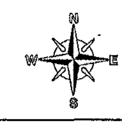
1. BOND ALL NON-INSULATING IN-LINE VALVE, FLANGES, TEES, CROSSES, COUPLINGS AND SPECIALS PER DETAIL 1, SHEET CP-2
2. THRUST BLOCKS NOT SHOWN FOR CLARITY. PROVIDE THRUST BLOCKS FOR ALL FITTINGS AND VALVES PER SDSD SDW-151.
3. WRAP ALL DI FITTINGS AND PIPE SPECIALS WITH PETROLEUM WAX TAPE.



STA 40+35.30
67TH ST AND EL CAJON BLVD
SCALE: 1/2" = 1'-0"
D / C-17



STA 44+13.45
67TH ST AND MOHAWK ST
SCALE: 1/2" = 1'-0"
E / C-17



C-26

69TH AND MOHAWK PUMP STATION

69TH AND MOHAWK PUMP STATION

CONNECTION DETAILS 2

CITY OF SAN DIEGO, CALIFORNIA
ENGINEERING AND CAPITAL PROJECTS DEPARTMENT
SHEET 31 OF 170 SHEETS

WATER 5-12011

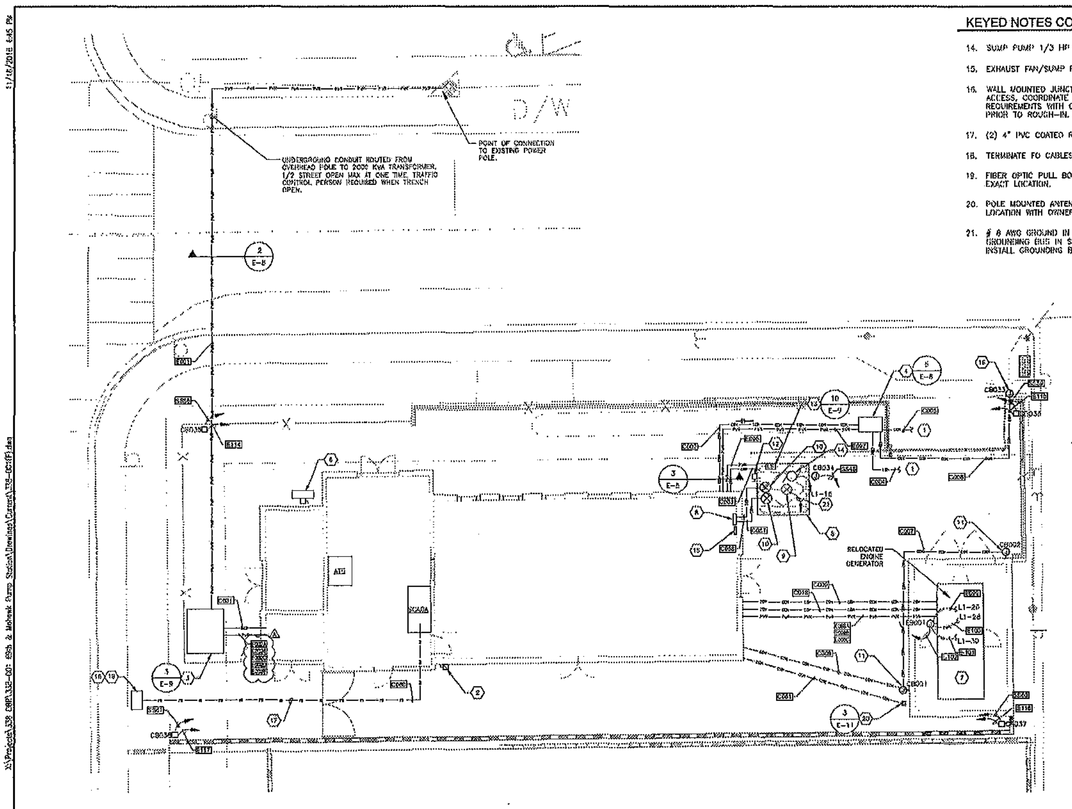
JOHN STOHR, PROJECT MANAGER
PROJECT ENGINEER

DESCRIPTION	BY	APPROVED	DATE	FILMED
ORIGINAL	MBI			
⚠ ADDENDUM B				

CONTRACTOR — DATE STARTED
INSPECTOR — DATE COMPLETED

218-1749
CCS27 COORDINATE
6310407, 1858444
CCS83 COORDINATE
38929- 31-D

⚠ REVISED DETAIL A ADDENDUM B



ELECTRICAL FLOOR PLAN - SITE
Scale: 1" = 8'-0"

KEYED NOTES CONTINUED

14. SUMP PUMP 1/3 HP MOTOR.
15. EXHAUST FAN/SUMP PUMP INDICATOR DISPLAY.
16. WALL MOUNTED JUNCTION BOX FOR GATE CONTROL ACCESS. COORDINATE EXACT MOUNTING LOCATION AND REQUIREMENTS WITH GATE CONTROL MANUFACTURER PRIOR TO ROUGH-IN.
17. (2) 4" PVC COATED RGS CONDUITS.
18. TERMINATE FO CABLES STRANDS ON PATCH PANEL.
19. FIBER OPTIC PULL BOX SEE CIVIL SHEET C-5 FOR EXACT LOCATION.
20. POLE MOUNTED ANTENNA. COORDINATE EXACT MOUNTING LOCATION WITH OWNER PRIOR TO ROUGH-IN.
21. # 6 AWG GROUND IN 3/4" RIGID CONDUIT FROM GROUNDING BUS IN SWITCHBOARD TO GROUNDING RING. INSTALL GROUNDING BUSHING AT BOTH ENDS.

GENERAL NOTES

A. SEE SHEET E-1 FOR LEGEND, AND ABBREVIATIONS.
B. SEE SHEET E-2 FOR PROJECT GENERAL NOTES.
C. SEE SHEET E-8 FOR SINGLE LINE DIAGRAM.
D. SEE SHEET E-12 THRU E-18 FOR SCHEDULES.
E. CONDUIT ROUTING SHOWN FOR DIAGRAMMATIC PURPOSES. COORDINATE CONDUIT ROUTE WITH FIELD CONDITIONS.
F. ALL MECHANICAL SHOWN IS FOR REFERENCE ONLY, COORDINATE EXACT LOCATION WITH MECHANICAL DRAWINGS.
G. ELECTRICAL INSTALLATION SHALL BE IN ACCORDANCE WITH CEC ARTICLE 250: GROUNDING AND BONDING.

KEYED NOTES

1. CONDUIT FOR GATE CONTROL REFLECTORS, COORDINATE REQUIREMENTS AND ROUTING WITH GATE CONTROL MANUFACTURER PRIOR TO ROUGH-IN.
2. MAIN BUILDING SERVICE DISCONNECT SWITCH. COORDINATE EXACT LOCATION WITH OWNER PRIOR TO ROUGH-IN.
3. 2000 KVA PAD MOUNTED TRANSFORMER.
4. GATE CONTROLLER BOX.
5. FLOW METER VAULT.
6. HP-1. SEE MECHANICAL DRAWINGS FOR EXACT LOCATION. DISCONNECT SUPPLIED BY MECHANICAL.
7. COORDINATE ALL POWER AND COMMUNICATION CONNECTIONS WITH GENERATOR MANUFACTURER PRIOR TO ROUGH-IN.
8. SUCTION AND DISCHARGE PRESSURE ANALOG DISPLAY. MOUNT ON UNISTRUT FRAME. SEE DETAIL 0/E-9.
9. 24" MAGNETIC FLOW METER.
10. PRESSURE TRANSMITTER.
11. COORDINATE JUNCTION BOX MOUNTING HEIGHT AND EXACT LOCATION WITH OWNER PRIOR TO ROUGH-IN.
12. SUMP PUMP DISCONNECT, NEMA 3R ENCLOSURE. MOUNT ON UNISTRUT FRAME. SEE DETAIL 8/E-9.
13. LEVEL SWITCH. CONNECT TO PLC I/O. SEE DETAIL 7/E-9.

LOPEZ ENGINEERING, INC.
PROFESSIONAL CONSULTING ENGINEERS
4205 Gesner St. Suite 20, San Diego, CA 92117, Tel (619) 275-6858, Fax (619) 275-1929
4700 Lincoln Rd. NE, Albuquerque, NM 87109, Tel (505) 342-6233, Fax (505) 342-6334
www.LopezEngineering.com

E-3

69TH AND MOHAWK PUMP STATION

ELECTRICAL - SITE PLAN

CITY OF SAN DIEGO, CALIFORNIA
ENGINEERING AND CAPITAL PROJECTS DEPARTMENT
SHEET 109 OF 170 SHEETS

WATER WBS S-12011

JOHN STOHR, PROJECT MANAGER

11/16/2016

DESCRIPTION	BY	APPROVED	DATE	FILMED
ORIGINAL	NSI			
ADDENDUM B	NSI		11/23/16	

SEE SHEETS
SEE SHEETS

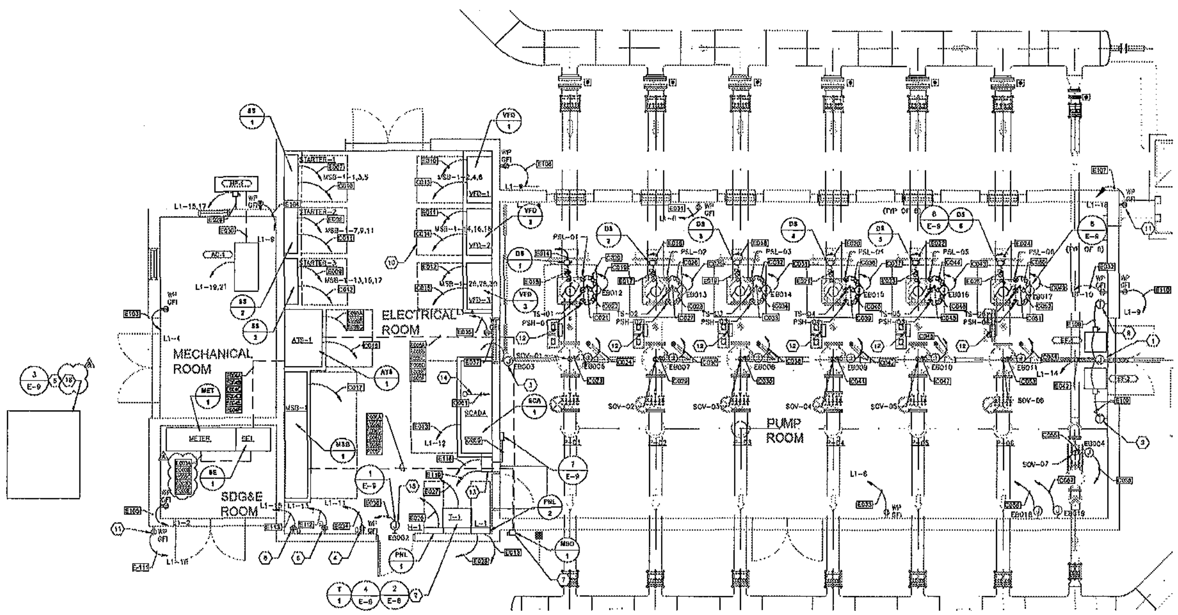
CONTRACTOR ______ DATE STARTED ______
INSPECTOR ______ DATE COMPLETED ______

38929-109-D

69TH AND MOWHAK PUMP STATION

SDG&E COMMENTS

ADDENDUM B



ELECTRICAL FLOOR PLAN - POWER
Scale: 1/4" = 1'-0"

KEYED NOTES CONTINUED

15. ELECTRONIC LOCKING DOOR, SEE ARCHITECTURAL DRAWINGS FOR ELECTRIFIED DOOR HARDWARE.
16. TRANSFORMER BY SDG&E.

GENERAL NOTES

A. SEE SHEET E-1 FOR LEGEND AND ABBREVIATIONS.
B. SEE SHEET E-2 FOR PROJECT GENERAL NOTES.
C. SEE SHEET E-6 FOR SINGLE LINE DIAGRAM.
D. SEE SHEET E-12 THRU E-18 FOR SCHEDULES.
E. CONDUIT ROUTING SHOWN FOR DIAGRAMMATIC PURPOSES. COORDINATE CONDUIT ROUTE WITH FIELD CONDITIONS.
F. ALL MECHANICAL SHOWN FOR REFERENCE ONLY. COORDINATE EXACT MOUNTING LOCATIONS WITH MECHANICAL DRAWINGS PRIOR TO ROUGH-IN.
G. CONCEAL CONDUIT IN WALL OR SLAB WHEREVER POSSIBLE.
H. CONTRACTOR TO SUBMIT CONDUIT ROUTE PLAN FOR APPROVAL PRIOR TO CONSTRUCTION.
I. ELECTRICAL INSTALLATION SHALL BE IN ACCORDANCE WITH CEC ARTICLE 250 GROUNDING AND BONDING.

KEYED NOTES

1. JUNCTION BOX FOR PROPELLER EXHAUST FANS MOUNTED ABOVE DOOR. COORDINATE EXACT MOUNTING LOCATION WITH MECHANICAL PRIOR TO ROUGH-IN.
2. 45KVA WALL MOUNTED TRANSFORMER.
3. JUNCTION BOX FOR MOTORIZED HOIST, COORDINATE EXACT MOUNTING LOCATION WITH HOIST MANUFACTURER PRIOR TO ROUGH-IN.
4. DEDICATED RECEPTACLE FOR FIRE ALARM PANEL.
5. 2000 KVA PAD MOUNTED TRANSFORMER, SEE SITE PLAN FOR CONDUIT ROUTES. COORDINATE EXACT LOCATION OF TRANSFORMER WITH OWNER PRIOR TO ROUGH-IN.
6. DEDICATED QUADRAPLEX RECEPTACLE FOR FACILITY PANEL. COORDINATE EXACT MOUNTING HEIGHT AND LOCATION WITH OWNER PRIOR TO ROUGH-IN.
7. MAIN BUILDING DISCONNECT. COORDINATE EXACT LOCATION WITH OWNER PRIOR TO ROUGH-IN.
8. DEDICATED QUADRAPLEX RECEPTACLE FOR TELEPHONE BACKBOARD. COORDINATE EXACT MOUNTING LOCATION AND HEIGHT WITH TELEPHONE BACKBOARD. SEE SHEET E-10 FOR TELEPHONE BACKBOARD DETAIL.
9. THERMOSTAT FOR PROPELLER EXHAUST FAN. COORDINATE EXACT MOUNTING LOCATION WITH MECHANICAL PRIOR TO ROUGH-IN.
10. ELECTRICAL EQUIPMENT CLEARANCE.
11. WALL MOUNTED RECEPTACLE 6" BELOW AWNING.
12. PULLBOX MOUNTED ON UNISTRUT FRAMES.
13. FLOOD CONTROL PANEL.
14. ROUTE CONDUIT TO POLE MOUNTED ANTENNA.

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E-6

69TH AND MOHAWK PUMP STATION

ELECTRICAL - POWER FLOOR PLAN

CITY OF SAN DIEGO, CALIFORNIA
ENGINEERING AND CAPITAL PROJECTS DEPARTMENT
SHEET 112 OF 170 SHEETS

WATER WBS S-12011

JOHN STOHR, PROJECT MANAGER

11/16/2016

ORIGINAL

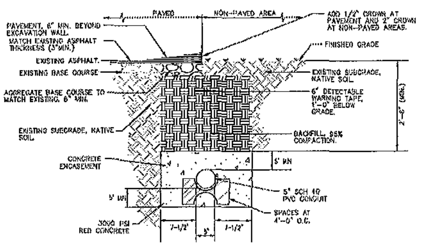
SEE SHEETS

38929-112-D

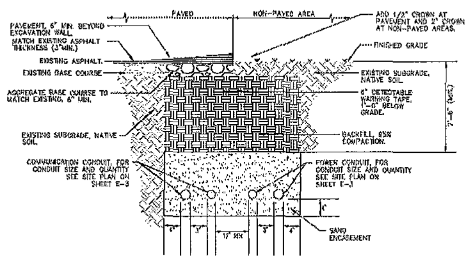
69TH AND MOWHAK PUMP STATION

SDG&E COMMENTS

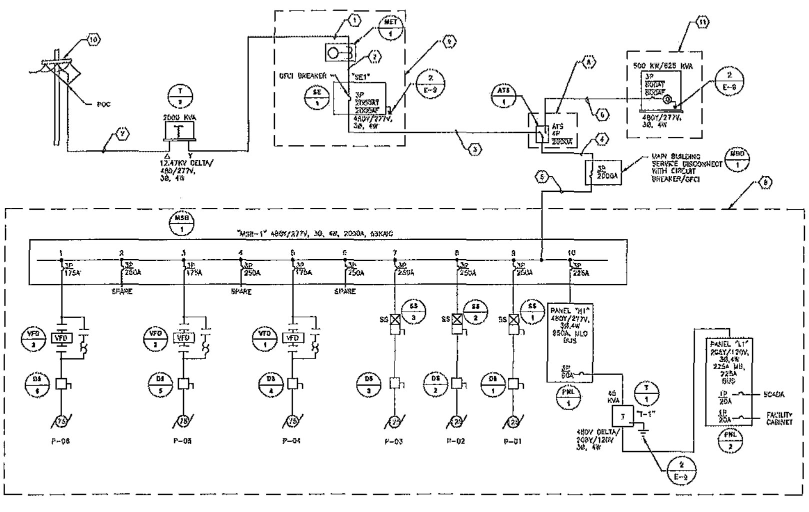
ADDENDUM B



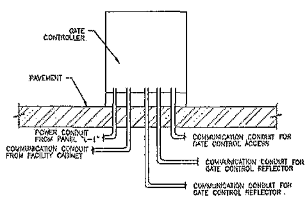
② TYPICAL TRENCH - DETAIL
Scale: N.T.S.



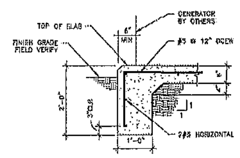
③ TYPICAL TRENCH - DETAIL
Scale: N.T.S.



① SINGLE LINE DIAGRAM
Scale: N.T.S.



⑤ GATE CONTROLLER - DETAIL
Scale: N.T.S.



④ TYPICAL FOUNDATION - DETAIL
Scale: N.T.S.

SEQUENCE OF OPERATION:

SEQUENCE OF OPERATION

1. LOSS OF POWER FROM SDG&E WILL SEND SIGNAL TO ENGINE GENERATOR FROM THE TRANSFER SWITCH TO START THE ENGINE GENERATOR AND TRANSFER LOADS TO EMERGENCY SOURCE.
2. PUMPS WILL BE MANUALLY RESTARTED ON AT A TIME. IT IS ESTIMATED THAT THE GENERATOR HAS ONLY CAPACITY TO RUN (3) SOFT START 120 HP PUMPS AND (1) 175 HP VFD PUMP.
3. IF THE MAIN BUILDING DISCONNECT "MDS-1" IS OPENED POWER IS LOST TO THE BUILDING, BUT THE ENGINE GENERATOR WILL NOT START AND THE ATS WILL NOT TRANSFER LOADS.
4. IF THE SDG&E CIRCUIT BREAKER "SE-1" IS OPENED POWER IS LOST TO THE BUILDING AND THE ENGINE GENERATOR WILL START AND THE ATS WILL TRANSFER LOADS.

GENERAL NOTES

A. SEE SHEET E-1 FOR LEGEND AND ABBREVIATIONS.
B. SEE SHEET E-2 FOR PROJECT GENERAL NOTES.
C. SEE SHEET E-14 FOR ELECTRICAL CONDUIT SCHEDULE.
D. ELECTRICAL INSTALLATION SHALL BE IN ACCORDANCE WITH CEC ARTICLE 250: GROUNDING AND BONDING.

KEYED NOTES

1. E002A, E002B, E002C, E002D, E002E
2. E003A, E003B, E003C, E003D, E003E
3. E004A, E004B, E004C, E004D, E004E, E004F
4. E005A, E005B, E005C, E005D, E005E, E005F
5. E006A, E006B, E006C, E006D, E006E, E006F
6. E101A, E101B, E101C
7. E001
8. ALL EQUIPMENT IN THIS AREA ARE INSTALLED IN ELECTRICAL ROOM.
9. ALL EQUIPMENT IN THIS AREA ARE INSTALLED IN SDG&E ROOM.
10. EXISTING POWER POLE. SEE SITE PLAN SHEET E-3 FOR LOCATION
11. LOCATED IN GENERATOR ENCLOSURE.

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E-8

69TH AND MOHAWK PUMP STATION

ELECTRICAL - SINGLE LINE DIAGRAM

CITY OF SAN DIEGO, CALIFORNIA
ENGINEERING AND CAPITAL PROJECTS DEPARTMENT
SHEET 114 OF 170 SHEETS

WATER WBS S-12011

JOHN STOHR, PROJECT MANAGER

11/16/2016

DESCRIPTION	BY	APPROVED	DATE	FILMED
ORIGINAL	NR			
ADDENDUM B	NR		[illegible]	

SEE SHEETS — CCS27 COORDINATE
SEE SHEETS — CCS83 COORDINATE

38929-114-D

CONTRACTOR ______ DATE STARTED ______
INSPECTOR ______ DATE COMPLETED ______

69TH AND MOWHAK PUMP STATION

SDG&E COMMENTS

ADDENDUM B

GENERAL NOTES

A. SEE SHEET E-1 FOR LEGEND AND ABBREVIATIONS.

B. SEE SHEET E-2 FOR PROJECT GENERAL NOTES.

KEYED NOTES

1. TRANSFORMER BY SDG&E.

ELECTRICAL EQUIPMENT SCHEDULE

SYMBOL	DESCRIPTION	MANUFACTURER	CATALOG NUMBER
OS 1	PASSIVE INFRARED (PIR) CEILING MOUNTED LOW VOLTAGE OCCUPANCY SENSOR WITH DISTINCT TECHNOLOGY, UL LISTED	COOPER LIGHTING	[illegible]
PS 1	OCCUPANCY SENSOR POWER PACK.	COOPER LIGHTING	SP20
S 1	TOGGLE SWITCH, 1P W/MATCHING WALL PLATE, WHITE	PASS & SEYMOUR	[illegible]
S 3	TOGGLE SWITCH, 3-WAY W/MATCHING WALL PLATE, WHITE	PASS & SEYMOUR	[illegible]SWG
S 4	TOGGLE SWITCH, 4-WAY W/MATCHING WALL PLATE, WHITE	PASS & SEYMOUR	[illegible]
MET 1	UTILITY METER TO MEET SDG&E REQUIREMENTS	-	-
SE 1	UTILITY DISCONNECT TO MEET SDG&E REQUIREMENTS	-	-
MBD 1	MAIN BUILDING DISCONNECT	-	-
PNL 1	ELECTRICAL PANEL BOARD- SEE SINGLE LINE DIAGRAM AND PANEL SCHEDULES FOR RATINGS.	SQUARE D	NQOD SERIES
PNL 2	ELECTRICAL PANEL BOARD- SEE SINGLE LINE DIAGRAM AND PANEL SCHEDULES FOR RATINGS.	SQUARE D	QO SERIES
MSB 1	ELECTRICAL SWITCHBOARD- SEE SINGLE LINE DIAGRAM AND PANEL SCHEDULES FOR RATINGS.	SQUARE D	[illegible], SERIES 2
T 1	TRANSFORMER DRY TYPE 45kva, NEMA 2, PRIMARY 480V DELTA, SECONDARY 208Y/120V	SQUARE D	[illegible]
T 2	PAD MOUNTED TRANSFORMER 300kva, NEMA 3, PRIMARY 12.47 DELTA, SECONDARY 480/277	-	-
SS 1	SOFTSTART SOLID STATE SMART MOTOR CONTROLLER	ALLEN-BRADLEY	SMC-50
SS 2	SOFTSTART SOLID STATE SMART MOTOR CONTROLLER	ALLEN-BRADLEY	SMC-50
SS 3	SOFTSTART SOLID STATE SMART MOTOR CONTROLLER	ALLEN-BRADLEY	SMC-50
VFD 1	VARIABLE FREQUENCY DRIVE, OUTPUT AT 480V, 60 Hz INPUT, IP20 NEMA 1 ENCLOSURE	ALLEN-BRADLEY	POWERFLEX 700
VFD 2	VARIABLE FREQUENCY DRIVE, OUTPUT AT 480V 60 Hz INPUT, IP20 NEMA 1 ENCLOSURE	ALLEN-BRADLEY	POWERFLEX 700
VFD 3	VARIABLE FREQUENCY DRIVE, OUTPUT AT 480V, 60 Hz INPUT, IP20 NEMA 1 ENCLOSURE	ALLEN-BRADLEY	POWERFLEX 700
ATS 1	AUTOMATIC TRANSFER SWITCH (ATS) ASCO 7000 SERIES	ASCO	A-10-D-3-200-480-5X-C-14A/14B-14T-14U-83E
SCA 1	SCADA		
LCP 1	DOUGLAS LIGHTING CONTROL PANEL, LITE PAK	DOUGLAS	WPAK4
DS 1	DISCONNECT SWITCH, 200 AMP, 600V, 3 POLE WITH GROUND BUS, NO FUSE, NEMA 1 ENCLOSURE, LABLE PUMP #1	SQUARE D	
DS 2	DISCONNECT SWITCH, 200 AMP, 600V, 3 POLE WITH GROUND BUS, NO FUSE, NEMA 1 ENCLOSURE, LABLE PUMP #2	SQUARE D	
DS 3	DISCONNECT SWITCH, 200 AMP, 600V, 3 POLE WITH GROUND BUS, NO FUSE, NEMA 1 ENCLOSURE, LABLE PUMP #3	SQUARE D	
DS 4	DISCONNECT SWITCH, 200 AMP, 600V, 3 POLE WITH GROUND BUS, NO FUSE, NEMA 1 ENCLOSURE, LABLE PUMP #4	SQUARE D	
DS 5	DISCONNECT SWITCH, 200 AMP, 600V, 3 POLE WITH GROUND BUS, NO FUSE, NEMA 1 ENCLOSURE, LABLE PUMP #5	SQUARE D	
DS 6	DISCONNECT SWITCH, 200 AMP, 600V, 3 POLE WITH GROUND BUS, NO FUSE, NEMA 1 ENCLOSURE, LABLE PUMP #6	SQUARE D	

(1) ELECTRICAL - EQUIPMENT SCHEDULE
Scale: N.T.S.

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E-13

69TH AND MOHAWK PUMP STATION

ELECTRICAL - EQUIPMENT SCHEDULE

CITY OF SAN DIEGO, CALIFORNIA
ENGINEERING AND CAPITAL PROJECTS DEPARTMENT
SHEET 118 OF 170 SHEETS

WATER WBS S-12011

JOHN STOHR, PROJECT MANAGER

11/16/2016

DESCRIPTION	BY	APPROVED	DATE	FILMED
ORIGINAL	NSI			
ADDENDUM B	NSI			

SEE SHEETS — CCS27 COORDINATE
SEE SHEETS — CCS83 COORDINATE

CONTRACTOR ______ DATE STARTED ______
INSPECTOR ______ DATE COMPLETED ______

38929-118-D

69TH AND MOWHAK PUMP STATION

SDG&E COMMENTS

ADDENDUM B

ELECTRICAL CONDUIT SCHEDULE

RACEWAY NUMBER	QUANTITIES	SIZE	FROM	TO	CONDUIT TYPE	CONDUCTORS	NOTES
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

ELECTRICAL CONDUIT SCHEDULE

RACEWAY NUMBER	QUANTITIES	SIZE	FROM	TO	CONDUIT TYPE	CONDUCTORS	NOTES
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

(1) ELECTRICAL - CONDUIT SCHEDULE

Scale: N.T.S.

GENERAL NOTES

A. SEE SHEET E-1 FOR LEGEND AND ABBREVIATIONS.

B. SEE SHEET E-2 FOR PROJECT GENERAL NOTES.

C. "BELOW SLAB" IS UNDER BUILDING.

D. "ABOVE SLAB" IS INSIDE BUILDING.

E. "BELOW GRADE" IS OUTSIDE BUILDING.

KEYED NOTES

1. USE XHHW SHIELDED CABLE FROM VFD'S TO MOTORS.
2. FOLLOW SDG&E SERVICE STANDARDS INCLUDING PVC SCHEDULE 80 ELBOWS AND SCHEDULE 80 ABOVE GRADE.
3. CONTRACTOR TO PROVIDE AND INSTALL CONDUIT. SDG&E TO PROVIDE AND INSTALL CABLE.
4. CABLE BY SDG&E.

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E-14

69TH AND MOHAWK PUMP STATION

ELECTRICAL - POWER CONDUIT SCHEDULE

CITY OF SAN DIEGO, CALIFORNIA
ENGINEERING AND CAPITAL PROJECTS DEPARTMENT
SHEET 119 OF 170 SHEETS

WATER WBS S-12011

11/16/2016

ALEX GARCIA

JOHN STOHR, PROJECT MANAGER

PROJECT ENGINEER

DESCRIPTION	BY	APPROVED	DATE	FILMED
ORIGINAL	NBI			
ADDENDUM B	NBI		11/18/16	

SEE SHEETS — CCS27 COORDINATE

SEE SHEETS — CCS83 COORDINATE

CONTRACTOR ____ DATE STARTED ____

INSPECTOR ____ DATE COMPLETED ____

38929-119-D

69TH AND MOWHAK PUMP STATION

SDG&E COMMENTS

ADDENDUM B

City of San Diego

CITY CONTACT: Michelle Muñoz, **Contract Specialist, Email:** MichelleM@sandiego.gov
Phone No. (619) 533-3482, **Fax No.** (619) 533-3633

ADDENDUM "C"

e - Bidding **FOR**

69TH & Mohawk Pump Station

BID NO.:	K-17-1401-DBB-3
SAP NO. (WBS/IO/CC):	S-12011
CLIENT DEPARTMENT:	2000
COUNCIL DISTRICT:	9
PROJECT TYPE:	BJ

BID DUE DATE:

2:00 PM
DECEMBER 15, 2016
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. Is not clear, is it ok to solicite a firm that is DBE or do they have to have a WBE MBE certification? I understand DBE is a broad base that included WBE MBE.

A1. MBE and WBE designations are different from DBE designations. An MBE or WBE is part of the larger universe of DBEs, but it will not meet the MBE/WBE requirement noted in the bidding document. MBEs and WBEs must be certified by EPA, SBA, DOT or by state, local, Tribal, or private entities whose certification criteria match EPAs in order to be counted toward MBE/WBE accomplishments.

Q2. Is not clear, Is it ok use one subcontractor for multiple NAICS codes?

A2. One firm can have multiple NAICS codes. It is possible for Contractors soliciting multiple NAICS codes to have one firm that is was solicited for multiple NAICS codes.

Q3. Does the prime have to locate 3 subcontractors from each of the outreach sources you have suggested? CPUC? Caltrans?, SBA? Or 3 total for each NAICS code we advertised to, no matter what agency we located them from.

A3. The Contractor shall send invitations to at least 3 DBE vendors for each item of work made available from each database for the scope of work that is being made available.

The Contractor shall use the SBA's Dynamic Small Business Search database to search for potential subcontractors, suppliers, and/or manufacturers. Provide a copy of search records with GFE documentation (page 78, Note 1).

CALTRANS maintains a database and provides directories of minority and woman-owned firms. The Contractor must provide copy of search records with GFE documentation (page 78, Note 4).

CPUC maintains a database of DBE-owned business enterprises and serves to inform the public. The Contractor must provide copy of search records with GFE documentation (page 78, Note 5).

James Nagelvoort, Director
Public Works Department

Dated: *November 29, 2016*
San Diego, California

JN/AJ/egz

City of San Diego

CITY CONTACT: Michelle Muñoz, **Contract Specialist, Email:** MichelleM@sandiego.gov
Phone No. (619) 533-3482, **Fax No.** (619) 533-3633

ADDENDUM "D"

e - Bidding **FOR**

69TH & Mohawk Pump Station

BID NO.:	**K-17-1401-DBB-3**
SAP NO. (WBS/IO/CC):	**S-12011**
CLIENT DEPARTMENT:	**2000**
COUNCIL DISTRICT:	**9**
PROJECT TYPE:	**BJ**

BID DUE DATE:

2:00 PM
JANUARY 25, 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.

THE SUBMITTAL DATE FOR THIS PROJECT HAS BEEN **EXTENDED AS STATED ON THE COVER PAGE.**

James Nagelvoort, Director
Public Works Department

Dated: *December 14, 2016*
San Diego, California

JN/AJ/lji

City of San Diego

CITY CONTACT: Michelle Muñoz, **Contract Specialist, Email:** MichelleM@sandiego.gov
Phone No. (619) 533-3482, **Fax No.** (619) 533-3633

ADDENDUM "E"

e - Bidding **FOR**

69TH & Mohawk Pump Station

BID NO.: **K-17-1401-DBB-3**
SAP NO. (WBS/IO/CC): **S-12011**
CLIENT DEPARTMENT: **2000**
COUNCIL DISTRICT: **9**
PROJECT TYPE: **BJ**

BID DUE DATE:

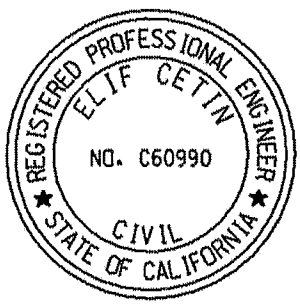
2:00 PM
JANUARY 27, 2017
CITY OF SAN DIEGO
PUBLIC WORKS CONTRACTS
1010 SECOND AVENUE, 14th FLOOR, MS 614C
SAN DIEGO, CA 92101

ENGINEER OF WORK

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

1) Registered Engineer — Date: 1/11/17 — Seal:

2) For City Engineer — Date: 1/12/17 — Seal:



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.

THE SUBMITTAL DATE FOR THIS PROJECT HAS BEEN **EXTENDED AS STATED ON THE COVER PAGE.**

B. BIDDER's QUESTIONS

Q1. I would like to know if the city is doing the PLC programming on this station or the contractor is supposed to. I found in Spec Section 01011 page 3 under Work by City that the city was going to handle the PLC programming and under Spec Section 13520 page 2 paragraph 2-2 C it lists that the contractor will program the PLC. In Section 16700 page 1 under paragraph b it again says the contractor will program. Please advise. Thank you!

A1. The City of San Diego is doing the PLC programming.

Q2. There is a discrepancy between plans and specs for the perimeter security fence. The fence and gate details and elevations shown on plan pages C-23 and C-24 show a tubular steel picket fence system called Aegis II as manufactured by Ameristar Perimeter Security. Specification section 02834 calls out for a high security steel fence system called Impasse II, also manufactured by Ameristar. These are two different systems, with the Aegis II being comprised of square tube steel pickets, posts and formed channel rails while the Impasse II is made with corrugated pales, larger formed channel rails, and roll-formed I-beam posts.

Please also confirm the style/configuration of the security fence. Some elevations show a fence with tube steel pickets curving outward above the top rail (detail B sheet C-7; detail A sheet C-8; detail C sheet C-23) which the manufacturer refers to as 'Invincible' style, while others show a fence panel with pickets extending straight up and referred to as 'Classic' style (detail F sheet C-24).

A2. Provide Aegis II system as manufactured by Ameristar Fence or City approved equal with 'Invincible' style pickets for all perimeter fencing and gates, except for the double swing entry gate (Detail A, Sheet C-23) and roll entry gate (Detail C, Sheet C-23) shall use the 'Classic' straight style pickets.

Q3. We received your November 8 reply to our question about the inconsistent wording concerning minimum and maximum values for authorization of work. However, we are still confused about the meaning of paragraph 6 in the Contract Agreement because your reply only refers to contract award for bid alternates, and does not address the problem with the language in paragraph 6 which says:

> The City shall guarantee the Contractor a minimum value of total work (Minimum Contract Amount) of $10,000 up to a potential maximum value of total work (Maximum Contract Amount) of $5,000,000. The period during which new Task Orders may be issued pursuant to this contract is 24 months or the expenditure of the $5,000,000, whichever comes first. The total Contract term, including the completion of all tasks, may not exceed 5 years.

We believe that paragraph 6 is misplaced in this contract. It seems to apply to projects that deal with periodic authorizations for indefinite tasks within a maximum budget over a limited time, such as minor road or utility repairs. This is not the same kind of project, as the bid documents here specify an award for definite scope of work within a definite time limit. Perhaps the person who drafted the Contract Agreement inadvertently inserted or left in the language of paragraph 6 from another contract form. In any case paragraph 6 should be deleted from the present Contract Agreement to be consistent with the rest of the contract documents.

A3. Attachment G will be replaced by Attachment G that is used for DBB contracts. (See Section D, 1. of this Addendum).

Q4. Is the City providing construction staking for this job? I do see a line item for Surveying & Mapping, but nothing in the specs.

A4. City provides one set of survey stakes; further layout or restaking at contractor cost only.

Q5. 1. The specifications schedule 40 PVC embedded in slabs per 16050 3.3 B.1e. and 16050 3.3 D.2.. Conduit schedule on drawings E14, 15 & 18 lists specific Conduit types for each specific conduit. Numerous conduit routings will be installed below and in the slabs as allowed by the specifications. Can we install PVC schedule 40 in these locations as allowed by the specs.? Thus the conduit Type listed on the drawing schedule is not mandatory? Does the specifications supersede the drawings?

2. There are numerous instances (drawing E-16 box# CB001 thru CB010) where the junction box schedules indicate 4" square box or 2" x 4" box" with single gang ring and or plate. The rating on the schedule indicates: Nema 4x Stainless Steel. We cannot locate a mfg.

that makes these boxes with single gang ring in stainless steel and rated nema 4x. Please provide MFG and model number of what the engineer is referring to.

3. There are numerous instances (drawing E-16) where the junction box schedules indicate 4" square (2gang?) box or 2" x 4" (1gang?) box" with single gang ring and or plate. The rating on the Junction Box schedule indicates: Nema 12 We cannot locate a mfg. that makes these boxes with single gang ring rated nema 12. Are the Boxes Cast boxes per 16050 2.6 B, thus they are either 1 gang or 2 gang. Please provide MFG and model number of what the engineer is referring to.

4. Will the windows need to have any special acoustic STC rating requirements? If yes, please provide a rating.

A5. 1. Install conduit type as indicated on drawing conduit schedule.

2. Recommended product: Leviton FDBX1-Y with Stainless Steel Plate.

3. Recommended product: Leviton FDBX1-Y with Stainless Steel Plate.

4. Coordinate with Architectural requirements. Suggested STC rating is 48.

Q6. Please see a list a questions below for the pressure gauges, pressure switches, RTD, temperature switches and temperature gauges.

Field-Mount Pressure Gauges:

a. they're specifying a bronze bourdon tube but all the associated mounting hardware is 316SS. Wouldn't it be more compatible for the tube to also be 316SS?

b. they state that surface-mounted gauges are to have ¼" NPT connections, and stem mounted shall have ½" connections. If both are used, how do we know which is which for it affects both part numbers and pricing, for any surface-mounted gauges (in a panel) might require mounting hardware like a flush-mounting ring?

c. do they want a plastic or shatter-proof glass window for they reference both?

d. dry or liquid filled?

e. they say that vacuum gauges shall be in "H2O vac. If so, might they be an Ashcroft 1188 bellows gauge vs. a 1279. Don't they mean "Hg vac?

f. they refer to both snubbers and pulsation dampeners. Would snubbers be acceptable for they would be much less costly, more compact, and just as effective?

g. what is meant about 'stem-mounted gauges shall have an adjustable viewing angle' for this would not apply to a pressure gauge?

h. they say that the 1279's shall be an open-front turret design. 1279's are solid front, not open front.

Pressure Switches:

a. are any of the switches to be differential switches vs. the straight pressure switches?

b. are some to be panel mounted only requiring a NEMA 1 enclosure and if so, which ones? Ashcroft does not offer a NEMA 1 switch and it would probably be a switch that could be offered by Dwyer.

c. snubbers or pulsation dampeners?

Resistance Temperature Detectors (RTD's):

a. what is the temperature range – standard or extended range?

b. do they want the RTD to also have a transmitter or just a connection head?

c. they want each RTD to have a 'weld mount style' thermowell – do they mean socket weld? What's the stem length of the RTD, is there insulation on the piping requiring the well to have a lag extension, if it's a socket-weld process connection what size, etc? All of this would affect the thermowell's part number and pricing.

Temperature Switches:

a. are the switches to have a direct mounted stem/bulb or is there to be capillary to the bulb to the switch body and if capillary or direct mounted, what length?

b. what is the temperature range?

c. same questions as with the RTD's regarding the thermowells.

Temperature Gauges:

a. it appears they are referring to both a bimetal thermometer and an Ashcroft Duratemp – correct?

b. for those that might be a Duratemp (having the 4 ½" phenolic case), what temperature range, bulb style, capillary length, and mounting hardware?

c. for those that are bimetal thermometers, what dial size (3" or 5"), stem length, and temperature range?

d. same questions as with the RTD's regarding the thermowells.

General Questions:

a. do they want the instruments provided with wired-on SS Tags?

b. do they want the factory to do the set/trip points on the pressure and temperature switches?

c. reference is made to diaphragm seals for both the gauges and pressure switches yet they're not appearing on the drawings – are there any?

A6. Field-Mount Pressure Gauges:

a. provide stainless steel tube in lieu of bronze.

b. Provide stem mounted for field mounted gauges. Provide surface or flush mount for gauges installed in control cabinet or on uni-strut racks.

c. Provide shatter-proof Glass

d. Provide dry pressure gauges

e. Specification 13563 2.5.D - All pressure switches shall be ranged in psi and all vacuum switches in inches of water.

f. Snubbers are acceptable.

g. Adjustable viewing angle not required

h. Provide solid front 1279.

Pressure Switches:

a. Provide High/Low pressure switches as indicated on the P&ID drawings.

b. Devices mounted in the Pump Room should be NEMA 4 or NEMA 4X rated enclosures.

c. Snubbers are acceptable.

Resistance Temperature Detectors (RTD's):

a. Standard range is acceptable (minimum 20-240 degrees F).

b. Standard range is acceptable (minimum 20-240 degrees F).

c. Coordinate thermowell mounting with mechanical piping configuration

Temperature Switches:

a. Direct Mount. Coordinate mounting with mechanical piping configuration

b. Standard range is acceptable (minimum 20-240 degrees F).

c. Coordinate thermowell mounting with mechanical piping configuration

Temperature Gauges:

a. Yes

b. Standard temperature range is acceptable (minimum 20-240 degrees F). Coordinate mounting with mechanical piping configuration

c. Temperature range minimum 20-240 degrees F. Coordinate mounting with mechanical piping configuration

d. Coordinate thermowell mounting with mechanical piping configuration

General Questions:

a. Yes

b. Temperature and Pressure set points shall be adjustable and determined in the field by City Water OPS department. Initial set points shall be indicated in the submittal package.

c. Yes, provide on all gauges and switches.

C. ADDENDUM:

1. To Addendum B, page 12, Section C, Attachments, Item 2, Section 9, "Wage Rates, pages 20 through 46, **DELETE** in their entirety and **SUBSTITUTE** with pages 9 through 34 of this Addendum.

D. ATTACHMENTS:

1. To Attachment G, Contract Agreement, pages 973 through 974, **DELETE** in their entirety and **SUBSTITUTE** with pages 35 through 36 of this Addendum.

James Nagelvoort, Director
Public Works Department

Dated: *January 17, 2017*
San Diego, California

JN/AJ/egz

9. **WAGE RATES:** This contract shall be subject to the following Davis-Bacon Wage Decisions:

General Decision Number: CA170001 01/06/2017 CA1

Superseded General Decision Number: CA20160001

State: California

Construction Types: Building, Heavy (Heavy and Dredging), Highway and Residential

County: San Diego County in California.

BUILDING CONSTRUCTION PROJECTS; DREDGING PROJECTS (does not include hopper dredge work); HEAVY CONSTRUCTION PROJECTS (does not include water well drilling); HIGHWAY CONSTRUCTION PROJECTS; RESIDENTIAL CONSTRUCTION PROJECTS (consisting of single family homes and apartments up to and including 4 stories)

Note: Under Executive Order (EO) 13658, an hourly minimum wage of $10.20 for calendar year 2017 applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2015. If this contract is covered by the EO, the contractor must pay all workers in any classification listed on this wage determination at least $10.20 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract in calendar year 2017. The EO minimum wage rate will be adjusted annually. Additional information on contractor requirements and worker protections under the EO is available at www.dol.gov/whd/govcontracts.

Modification Number	Publication Date
0	01/06/2017

ASBE0005-002 07/04/2016

	Rates	Fringes
Asbestos Workers/Insulator (Includes the application of all insulating materials, protective coverings, coatings, and finishes to all types of mechanical systems)	$ 38.37	20.13
Fire Stop Technician (Application of Firestopping Materials for wall openings and penetrations in walls, floors, ceilings and curtain walls)	$ 26.15	17.31

ASBE0005-004 07/04/2016

	Rates	Fringes
Asbestos Removal worker/hazardous material handler (Includes preparation, wetting, stripping, removal, scrapping, vacuuming, bagging and disposing of all insulation materials from mechanical systems, whether they contain asbestos or not)	$ 18.38	10.82

BOIL0092-003 10/01/2012

	Rates	Fringes
BOILERMAKER	$ 41.17	28.27

* BRCA0004-008 11/01/2016

	Rates	Fringes
BRICKLAYER; MARBLE SETTER	$ 35.30	17.35

* BRCA0018-004 06/01/2016

	Rates	Fringes
MARBLE FINISHER	$ 29.20	12.93
TILE FINISHER	$ 24.53	11.08
TILE LAYER	$ 35.89	9.08

* BRCA0018-010 09/01/2016

	Rates	Fringes
TERRAZZO FINISHER	$ 28.53	12.27
TERRAZZO WORKER/SETTER	$ 35.57	13.14

CARP0409-002 07/01/2008

	Rates	Fringes
Diver		
(1) Wet	$ 663.68	9.82
(2) Standby	$ 331.84	9.82
(3) Tender	$ 323.84	9.82
(4) Assistant Tender	$ 299.84	9.82

Amounts in "Rates' column are per day

CARP0409-008 08/01/2010

	Rates	Fringes
Modular Furniture Installer	$ 17.00	7.41

CARP0547-001 07/01/2009

	Rates	Fringes
CARPENTER		
(1) Bridge	$ 37.28	10.58
(2) Commercial Building	$ 32.30	10.58
(3) Heavy & Highway	$ 37.15	10.58
(4) Residential Carpenter	$ 25.84	10.58
(5) Residential Insulation Installer	$ 18.00	8.16
MILLWRIGHT	$ 37.65	10.58
PILEDRIVERMAN	$ 37.28	10.58

CARP0547-002 07/01/2009

	Rates	Fringes
Drywall		
(1) Work on wood framed construction of single family residences, apartments or condominiums under four stories		
Drywall Installer/Lather	$ 21.00	8.58
Drywall Stocker/Scrapper	$ 11.00	6.67
(2) All other work		
Drywall Installer/Lather	$ 27.35	9.58
Drywall Stocker/Scrapper	$ 11.00	6.67

ELEC0569-001 10/01/2016

	Rates	Fringes
Electricians (Tunnel Work)		
Cable Splicer	$ 47.72	3%+12.63
Electrician	$ 46.97	3%+12.63
Electricians: (All Other Work, Including 4 Stories		

Residential)
Cable Splicer.....$ 42.50 3%+12.63
Electrician.....$ 41.75 3%+12.63

ELEC0569-004 06/01/2015

	Rates	Fringes
ELECTRICIAN (Sound & Communications Sound Technician)	$ 29.55	11.92

SOUND TECHNICIAN: Terminating, operating and performing final check-out

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ELEC0569-005 06/06/2016

	Rates	Fringes
Sound & Communications		
Sound Technician	$ 30.22	12.21

SOUND TECHNICIAN: Terminating, operating and performing final check-out

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ELEC0569-006 10/05/2015

Work on street lighting; traffic signals; and underground systems and/or established easements outside of buildings

	Rates	Fringes
Traffic signal, street light and underground work		
Utility Technician #1	$ 29.50	8.31
Utility Technician #2	$ 24.65	8.16

STREET LIGHT & TRAFFIC SIGNAL WORK:

UTILITY TECHNICIAN #1: Installation of street lights and traffic signals, including electrical circuitry, programmable controller, pedestal-mounted electrical meter enclosures and laying of pre-assembled cable in ducts. The layout of electrical systems and communication installation including proper position of trench depths, and radius at duct banks, location for manholes, street lights and traffic signals.

UTILITY TECHNICIAN #2: Distribution of material at jobsite, installation of underground ducts for electrical, telephone, cable TV land communication systems. The setting, leveling, grounding and racking of precast manholes, handholes and transformer pads.

ELEC0569-008 06/06/2016

	Rates	Fringes
ELECTRICIAN (Residential, 1-3 Stories)	$ 31.69	3%+6.61

ELEC1245-001 06/01/2015

	Rates	Fringes
LINE CONSTRUCTION		
(1) Lineman; Cable splicer	$ 52.85	15.53
(2) Equipment specialist (operates crawler tractors, commercial motor vehicles, backhoes, trenchers, cranes (50 tons and below), overhead & underground distribution line equipment)	$ 42.21	14.32
(3) Groundman	$ 32.28	14.03
(4) Powderman	$ 47.19	14.60

HOLIDAYS: New Year's Day, M.L. King Day, Memorial Day, Independence Day, Labor Day, Veterans Day, Thanksgiving Day and day after Thanksgiving, Christmas Day

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ELEV0018-001 01/01/2015

	Rates	Fringes
ELEVATOR MECHANIC	$ 49.90	28.38

FOOTNOTE:
PAID VACATION: Employer contributes 8% of regular hourly rate as vacation pay credit for employees with more than 5 years of service, and 6% for 6 months to 5 years of service.
PAID HOLIDAYS: New Years Day, Memorial Day, Independence Day, Labor Day, Veterans Day, Thanksgiving Day, Friday after Thanksgiving, and Christmas Day.

ENGI0012-003 07/01/2016

	Rates	Fringes
OPERATOR: Power Equipment (All Other Work)		
GROUP 1	$ 39.95	23.35
GROUP 2	$ 40.73	23.35
GROUP 3	$ 41.02	23.35
GROUP 4	$ 42.51	23.35
GROUP 5	$ 41.86	23.35
GROUP 6	$ 41.83	23.35
GROUP 8	$ 42.84	23.35
GROUP 9	$ 42.19	23.35
GROUP 10	$ 42.96	23.35
GROUP 11	$ 42.31	23.35

GROUP 12	$ 43.13	23.35
GROUP 13	$ 43.23	23.35
GROUP 14	$ 43.26	23.35
GROUP 15	$ 43.34	23.35
GROUP 16	$ 43.46	23.35
GROUP 17	$ 43.63	23.35
GROUP 18	$ 43.73	23.35
GROUP 19	$ 43.84	23.35
GROUP 20	$ 43.96	23.35
GROUP 21	$ 44.13	23.35
GROUP 22	$ 44.23	23.35
GROUP 23	$ 44.34	23.35
GROUP 24	$ 44.46	23.35
GROUP 25	$ 44.63	23.35
OPERATOR: Power Equipment (Cranes, Piledriving & Hoisting)		
GROUP 1	$ 43.20	22.15
GROUP 2	$ 43.98	22.15
GROUP 3	$ 44.27	22.15
GROUP 4	$ 44.41	22.15
GROUP 5	$ 44.63	22.15
GROUP 6	$ 44.74	22.15
GROUP 7	$ 44.86	22.15
GROUP 8	$ 45.03	22.15
GROUP 9	$ 45.20	22.15
GROUP 10	$ 46.20	22.15
GROUP 11	$ 47.20	22.15
GROUP 12	$ 48.20	22.15
GROUP 13	$ 49.20	22.15
OPERATOR: Power Equipment (Tunnel Work)		
GROUP 1	$ 41.80	23.35
GROUP 2	$ 42.58	23.35
GROUP 3	$ 42.87	23.35
GROUP 4	$ 43.01	23.35
GROUP 5	$ 43.23	23.35
GROUP 6	$ 43.34	23.35
GROUP 7	$ 43.46	23.35

PREMIUM PAY:

$3.75 per hour shall be paid on all Power Equipment Operator work on the followng Military Bases: China Lake Naval Reserve, Vandenberg AFB, Point Arguello, Seely Naval Base, Fort Irwin, Nebo Annex Marine Base, Marine Corp Logistics Base Yermo, Edwards AFB, 29 Palms Marine Base and Camp Pendleton

Workers required to suit up and work in a hazardous material environment: $2.00 per hour additional. Combination mixer and compressor operator on gunite work shall be classified as a concrete mobile mixer operator.

SEE ZONE DEFINITIONS AFTER CLASSIFICATIONS

POWER EQUIPMENT OPERATORS CLASSIFICATIONS

GROUP 1: Bargeman; Brakeman; Compressor operator; Ditch

Witch, with seat or similar type equipment; Elevator operator-inside; Engineer Oiler; Forklift operator (includes loed, lull or similar types under 5 tons; Generator operator; Generator, pump or compressor plant operator; Pump operator; Signalman; Switchman
GROUP 2: Asphalt-rubber plant operator (nurse tank operator); Concrete mixer operator-skip type; Conveyor operator; Fireman; Forklift operator (includes loed, lull or similar types over 5 tons; Hydrostatic pump operator; oiler crusher (asphalt or concrete plant); Petromat laydown machine; PJU side dum jack; Screening and conveyor machine operator (or similar types); Skiploader (wheel type up to 3/4 yd. without attachment); Tar pot fireman; Temporary heating plant operator; Trenching machine oiler

GROUP 3: Asphalt-rubber blend operator; Bobcat or similar type (Skid steer); Equipment greaser (rack); Ford Ferguson (with dragtype attachments); Helicopter radioman (ground); Stationary pipe wrapping and cleaning machine operator

GROUP 4: Asphalt plant fireman; Backhoe operator (mini-max or similar type); Boring machine operator; Boxman or mixerman (asphalt or concrete); Chip spreading machine operator; Concrete cleaning decontamination machine operator; Concrete Pump Operator (small portable); Drilling machine operator, small auger types (Texoma super economatic or similar types - Hughes 100 or 200 or similar types - drilling depth of 30' maximum); Equipment greaser (grease truck); Guard rail post driver operator; Highline cableway signalman; Hydra-hammer-aero stomper; Micro Tunneling (above ground tunnel); Power concrete curing machine operator; Power concrete saw operator; Power-driven jumbo form setter operator; Power sweeper operator; Rock Wheel Saw/Trencher; Roller operator (compacting); Screed operator (asphalt or concrete); Trenching machine operator (up to 6 ft.); Vacuum or much truck

GROUP 5: Equipment Greaser (Grease Truck/Multi Shift).

GROUP 6: Articulating material hauler; Asphalt plant engineer; Batch plant operator; Bit sharpener; Concrete joint machine operator (canal and similar type); Concrete planer operator; Dandy digger; Deck engine operator; Derrickman (oilfield type); Drilling machine operator, bucket or auger types (Calweld 100 bucket or similar types - Watson 1000 auger or similar types - Texoma 330, 500 or 600 auger or similar types - drilling depth of 45' maximum); Drilling machine operator; Hydrographic seeder machine operator (straw, pulp or seed), Jackson track maintainer, or similar type; Kalamazoo Switch tamper, or similar type; Machine tool operator; Maginnis internal full slab vibrator, Mechanical berm, curb or gutter(concrete or asphalt); Mechanical finisher operator (concrete, Clary-Johnson-Bidwell or similar); Micro tunnel system (below ground); Pavement breaker operator (truck mounted); Road oil mixing machine operator; Roller operator (asphalt or finish), rubber-tired earth moving equipment (single engine, up to and including 25 yds. struck); Self-propelled

tar pipelining machine operator; Skiploader operator (crawler and wheel type, over 3/4 yd. and up to and including 1-1/2 yds.); Slip form pump operator (power driven hydraulic lifting device for concrete forms); Tractor operator-bulldozer, tamper-scraper (single engine, up to 100 h.p. flywheel and similar types, up to and including D-5 and similar types); Tugger hoist operator (1 drum); Ultra high pressure waterjet cutting tool system operator; Vacuum blasting machine operator

GROUP 8: Asphalt or concrete spreading operator (tamping or finishing); Asphalt paving machine operator (Barber Greene or similar type); Asphalt-rubber distribution operator; Backhoe operator (up to and including 3/4 yd.), small ford, Case or similar; Cast-in-place pipe laying machine operator; Combination mixer and compressor operator (gunite work); Compactor operator (self-propelled); Concrete mixer operator (paving); Crushing plant operator; Drill Doctor; Drilling machine operator, Bucket or auger types (Calweld 150 bucket or similar types - Watson 1500, 2000 2500 auger or similar types - Texoma 700, 800 auger or similar types - drilling depth of 60' maximum); Elevating grader operator; Grade checker; Gradall operator; Grouting machine operator; Heavy-duty repairman; Heavy equipment robotics operator; Kalamazoo balliste regulator or similar type; Kolman belt loader and similar type; Le Tourneau blob compactor or similar type; Loader operator (Athey, Euclid, Sierra and similar types); Mobark Chipper or similar; Ozzie padder or similar types; P.C. slot saw; Pneumatic concrete placing machine operator (Hackley-Presswell or similar type); Pumpcrete gun operator; Rock Drill or similar types; Rotary drill operator (excluding caisson type); Rubber-tired earth-moving equipment operator (single engine, caterpillar, Euclid, Athey Wagon and similar types with any and all attachments over 25 yds. up to and including 50 cu. yds. struck); Rubber-tired earth-moving equipment operator (multiple engine up to and including 25 yds. struck); Rubber-tired scraper operator (self-loading paddle wheel type-John Deere, 1040 and similar single unit); Self-propelled curb and gutter machine operator; Shuttle buggy; Skiploader operator (crawler and wheel type over 1-1/2 yds. up to and including 6-1/2 yds.); Soil remediation plant operator; Surface heaters and planer operator; Tractor compressor drill combination operator; Tractor operator (any type larger than D-5 - 100 flywheel h.p. and over, or similar-bulldozer, tamper, scraper and push tractor single engine); Tractor operator (boom attachments), Traveling pipe wrapping, cleaning and bendng machine operator; Trenching machine operator (over 6 ft. depth capacity, manufacturer's rating); trenching Machine with Road Miner attachment (over 6 ft depth capacity): Ultra high pressure waterjet cutting tool system mechanic; Water pull (compaction) operator

GROUP 9: Heavy Duty Repairman

GROUP 10: Drilling machine operator, Bucket or auger types (Calweld 200 B bucket or similar types-Watson 3000 or 5000

auger or similar types-Texoma 900 auger or similar types-drilling depth of 105' maximum); Dual drum mixer, dynamic compactor LDC350 (or similar types); Monorail locomotive operator (diesel, gas or electric); Motor patrol-blade operator (single engine); Multiple engine tractor operator (Euclid and similar type-except Quad 9 cat.); Rubber-tired earth-moving equipment operator (single engine, over 50 yds. struck); Pneumatic pipe ramming tool and similar types; Prestressed wrapping machine operator; Rubber-tired earth-moving equipment operator (single engine, over 50 yds. struck); Rubber tired earth moving equipment operator (multiple engine, Euclid, caterpillar and similar over 25 yds. and up to 50 yds. struck), Tower crane repairman; Tractor loader operator (crawler and wheel type over 6-1/2 yds.); Woods mixer operator (and similar Pugmill equipment)

GROUP 11: Heavy Duty Repairman - Welder Combination, Welder - Certified.

GROUP 12: Auto grader operator; Automatic slip form operator; Drilling machine operator, bucket or auger types (Calweld, auger 200 CA or similar types - Watson, auger 6000 or similar types - Hughes Super Duty, auger 200 or similar types - drilling depth of 175' maximum); Hoe ram or similar with compressor; Mass excavator operator less tha 750 cu. yards; Mechanical finishing machine operator; Mobile form traveler operator; Motor patrol operator (multi-engine); Pipe mobile machine operator; Rubber-tired earth- moving equipment operator (multiple engine, Euclid, Caterpillar and similar type, over 50 cu. yds. struck); Rubber-tired self- loading scraper operator (paddle-wheel-auger type self-loading - two (2) or more units)

GROUP 13: Rubber-tired earth-moving equipment operator operating equipment with push-pull system (single engine, up to and including 25 yds. struck)

GROUP 14: Canal liner operator; Canal trimmer operator; Remote- control earth-moving equipment operator (operating a second piece of equipment: $1.00 per hour additional); Wheel excavator operator (over 750 cu. yds.)

GROUP 15: Rubber-tired earth-moving equipment operator, operating equipment with push-pull system (single engine, Caterpillar, Euclid, Athey Wagon and similar types with any and all attachments over 25 yds. and up to and including 50 yds. struck); Rubber-tired earth-moving equipment operator, operating equipment with push-pull system (multiple engine-up to and including 25 yds. struck)

GROUP 16: Rubber-tired earth-moving equipment operator, operating equipment with push-pull system (single engine, over 50 yds. struck); Rubber-tired earth-moving equipment operator, operating equipment with push-pull system (multiple engine, Euclid, Caterpillar and similar, over 25 yds. and up to 50 yds. struck)

GROUP 17: Rubber-tired earth-moving equipment operator, operating equipment with push-pull system (multiple engine, Euclid, Caterpillar and similar, over 50 cu. yds. struck); Tandem tractor operator (operating crawler type tractors in tandem - Quad 9 and similar type)

GROUP 18: Rubber-tired earth-moving equipment operator, operating in tandem (scrapers, belly dumps and similar types in any combination, excluding compaction units - single engine, up to and including 25 yds. struck)

GROUP 19: Rotex concrete belt operator (or similar types); Rubber-tired earth-moving equipment operator, operating in tandem (scrapers, belly dumps and similar types in any combination, excluding compaction units - single engine, Caterpillar, Euclid, Athey Wagon and similar types with any and all attachments over 25 yds.and up to and including 50 cu. yds. struck); Rubber-tired earth-moving equipment operator, operating in tandem (scrapers, belly dumps and similar types in any combination, excluding compaction units - multiple engine, up to and including 25 yds. struck)

GROUP 20: Rubber-tired earth-moving equipment operator, operating in tandem (scrapers, belly dumps and similar types in any combination, excluding compaction units - single engine, over 50 yds. struck); Rubber-tired earth-moving equipment operator, operating in tandem (scrapers, belly dumps, and similar types in any combination, excluding compaction units - multiple engine, Euclid, Caterpillar and similar, over 25 yds. and up to 50 yds. struck)

GROUP 21: Rubber-tired earth-moving equipment operator, operating in tandem (scrapers, belly dumps and similar types in any combination, excluding compaction units - multiple engine, Euclid, Caterpillar and similar type, over 50 cu. yds. struck)

GROUP 22: Rubber-tired earth-moving equipment operator, operating equipment with the tandem push-pull system (single engine, up to and including 25 yds. struck)

GROUP 23: Rubber-tired earth-moving equipment operator, operating equipment with the tandem push-pull system (single engine, Caterpillar, Euclid, Athey Wagon and similar types with any and all attachments over 25 yds. and up to and including 50 yds. struck); Rubber-tired earth-moving equipment operator, operating with the tandem push-pull system (multiple engine, up to and including 25 yds. struck)

GROUP 24: Rubber-tired earth-moving equipment operator, operating equipment with the tandem push-pull system (single engine, over 50 yds. struck); Rubber-tired earth-moving equipment operator, operating equipment with the tandem push-pull system (multiple engine, Euclid, Caterpillar and similar, over 25 yds. and up to 50 yds. struck)

GROUP 25: Concrete pump operator-truck mounted; Rubber-tired earth-moving equipment operator, operating equipment with the tandem push-pull system (multiple engine, Euclid, Caterpillar and similar type, over 50 cu. yds. struck)

CRANES, PILEDRIVING AND HOISTING EQUIPMENT CLASSIFICATIONS

GROUP 1: Engineer oiler; Fork lift operator (includes loed, lull or similar types)

GROUP 2: Truck crane oiler

GROUP 3: A-frame or winch truck operator; Ross carrier operator (jobsite)

GROUP 4: Bridge-type unloader and turntable operator; Helicopter hoist operator

GROUP 5: Hydraulic boom truck; Stinger crane (Austin-Western or similar type); Tugger hoist operator (1 drum)

GROUP 6: Bridge crane operator; Cretor crane operator; Hoist operator (Chicago boom and similar type); Lift mobile operator; Lift slab machine operator (Vagtborg and similar types); Material hoist and/or manlift operator; Polar gantry crane operator; Self Climbing scaffold (or similar type); Shovel, backhoe, dragline, clamshell operator (over 3/4 yd. and up to 5 cu. yds. mrc); Tugger hoist operator

GROUP 7: Pedestal crane operator; Shovel, backhoe, dragline, clamshell operator (over 5 cu. yds. mrc); Tower crane repair; Tugger hoist operator (3 drum)

GROUP 8: Crane operator (up to and including 25 ton capacity); Crawler transporter operator; Derrick barge operator (up to and including 25 ton capacity); Hoist operator, stiff legs, Guy derrick or similar type (up to and including 25 ton capacity); Shovel, backhoe, dragline, clamshell operator (over 7 cu. yds., M.R.C.)

GROUP 9: Crane operator (over 25 tons and up to and including 50 tons mrc); Derrick barge operator (over 25 tons up to and including 50 tons mrc); Highline cableway operator; Hoist operator, stiff legs, Guy derrick or similar type (over 25 tons up to and including 50 tons mrc); K-crane operator; Polar crane operator; Self erecting tower crane operator maximum lifting capacity ten tons

GROUP 10: Crane operator (over 50 tons and up to and including 100 tons mrc); Derrick barge operator (over 50 tons up to and including 100 tons mrc); Hoist operator, stiff legs, Guy derrick or similar type (over 50 tons up to and including 100 tons mrc), Mobile tower crane operator (over 50 tons, up to and including 100 tons M.R.C.); Tower crane operator and tower gantry

GROUP 11: Crane operator (over 100 tons and up to and

including 200 tons mrc); Derrick barge operator (over 100 tons up to and including 200 tons mrc); Hoist operator, stiff legs, Guy derrick or similar type (over 100 tons up to and including 200 tons mrc); Mobile tower crane operator (over 100 tons up to and including 200 tons mrc)

GROUP 12: Crane operator (over 200 tons up to and including 300 tons mrc); Derrick barge operator (over 200 tons up to and including 300 tons mrc); Hoist operator, stiff legs, Guy derrick or similar type (over 200 tons, up to and including 300 tons mrc); Mobile tower crane operator (over 200 tons, up to and including 300 tons mrc)

GROUP 13: Crane operator (over 300 tons); Derrick barge operator (over 300 tons); Helicopter pilot; Hoist operator, stiff legs, Guy derrick or similar type (over 300 tons); Mobile tower crane operator (over 300 tons)

TUNNEL CLASSIFICATIONS

GROUP 1: Skiploader (wheel type up to 3/4 yd. without attachment)

GROUP 2: Power-driven jumbo form setter operator

GROUP 3: Dinkey locomotive or motorperson (up to and including 10 tons)

GROUP 4: Bit sharpener; Equipment greaser (grease truck); Slip form pump operator (power-driven hydraulic lifting device for concrete forms); Tugger hoist operator (1 drum); Tunnel locomotive operator (over 10 and up to and including 30 tons)

GROUP 5: Backhoe operator (up to and including 3/4 yd.); Small Ford, Case or similar; Drill doctor; Grouting machine operator; Heading shield operator; Heavy-duty repairperson; Loader operator (Athey, Euclid, Sierra and similar types); Mucking machine operator (1/4 yd., rubber-tired, rail or track type); Pneumatic concrete placing machine operator (Hackley-Presswell or similar type); Pneumatic heading shield (tunnel); Pumpcrete gun operator; Tractor compressor drill combination operator; Tugger hoist operator (2 drum); Tunnel locomotive operator (over 30 tons)

GROUP 6: Heavy Duty Repairman

GROUP 7: Tunnel mole boring machine operator

ENGINEERS ZONES

$1.00 additional per hour for all of IMPERIAL County and the portions of KERN, RIVERSIDE & SAN BERNARDINO Counties as defined below:

That area within the following Boundary: Begin in San Bernardino County, approximately 3 miles NE of the intersection of I-15 and the California State line at that point which is

the NW corner of Section 1, T17N,m R14E, San Bernardino Meridian. Continue W in a straight line to that point which is the SW corner of the northwest quarter of Section 6, T27S, R42E, Mt. Diablo Meridian. Continue North to the intersection with the Inyo County Boundary at that point which is the NE corner of the western half of the northern quarter of Section 6, T25S, R42E, MDM. Continue W along the Inyo and San Bernardino County boundary until the intersection with Kern County, as that point which is the SE corner of Section 34, T24S, R40E, MDM. Continue W along the Inyo and Kern County boundary until the intersection with Tulare County, at that point which is the SW corner of the SE quarter of Section 32, T24S, R37E, MDM. Continue W along the Kern and Tulare County boundary, until that point which is the NW corner of T25S, R32E, MDM. Continue S following R32E lines to the NW corner of T31S, R32E, MDM. Continue W to the NW corner of T31S, R31E, MDM. Continue S to the SW corner of T32S, R31E, MDM. Continue W to SW corner of SE quarter of Section 34, T32S, R30E, MDM. Continue S to SW corner of T11N, R17W, SBM. Continue E along south boundary of T11N, SBM to SW corner of T11N, R7W, SBM. Continue S to SW corner of T9N, R7W, SBM. Continue E along south boundary of T9N, SBM to SW corner of T9N, R1E, SBM. Continue S along west boundary of R1E, SMB to Riverside County line at the SW corner of T1S, R1E, SBM. Continue E along south boundary of T1s, SBM (Riverside County Line) to SW corner of T1S, R10E, SBM. Continue S along west boundary of R10E, SBM to Imperial County line at the SW corner of T8S, R10E, SBM. Continue W along Imperial and Riverside county line to NW corner of T9S, R9E, SBM. Continue S along the boundary between Imperial and San Diego Counties, along the west edge of R9E, SBM to the south boundary of Imperial County/California state line. Follow the California state line west to Arizona state line, then north to Nevada state line, then continuing NW back to start at the point which is the NW corner of Section 1, T17N, R14E, SBM

$1.00 additional per hour for portions of SAN LUIS OBISPO, KERN, SANTA BARBARA & VENTURA as defined below:

That area within the following Boundary: Begin approximately 5 miles north of the community of Cholame, on the Monterey County and San Luis Obispo County boundary at the NW corner of T25S, R16E, Mt. Diablo Meridian. Continue south along the west side of R16E to the SW corner of T30S, R16E, MDM. Continue E to SW corner of T30S, R17E, MDM. Continue S to SW corner of T31S, R17E, MDM. Continue E to SW corner of T31S, R18E, MDM. Continue S along West side of R18E, MDM as it crosses into San Bernardino Meridian numbering area and becomes R30W. Follow the west side of R30W, SBM to the SW corner of T9N, R30W, SBM. Continue E along the south edge of T9N, SBM to the Santa Barbara County and Ventura County boundary at that point whch is the SW corner of Section 34.T9N, R24W, SBM, continue S along the Ventura County line to that point which is the SW corner of the SE quarter of Section 32, T7N, R24W, SBM. Continue E along the south edge of T7N, SBM to the SE corner to T7N, R21W, SBM. Continue N along East side of R21W, SBM to Ventura County and Kern County boundary at the NE corner of T8N, R21W. Continue W along the Ventura County and Kern County boundary to

the SE corner of T9N, R21W. Continue North along the East edge of R21W, SBM to the NE corner of T12N, R21W, SBM. Continue West along the north edge of T12N, SBM to the SE corner of T32S, R21E, MDM. [T12N SBM is a think strip between T11N SBM and T32S MDM]. Continue North along the East side of R21E, MDM to the Kings County and Kern County border at the NE corner of T25S, R21E, MDM, continue West along the Kings County and Kern County Boundary until the intersection of San Luis Obispo County. Continue west along the Kings County and San Luis Obispo County boundary until the intersection with Monterey County. Continue West along the Monterey County and San Luis Obispo County boundary to the beginning point at the NW corner of T25S, R16E, MDM.

$2.00 additional per hour for INYO and MONO Counties and the Northern portion of SAN BERNARDINO County as defined below:

That area within the following Boundary: Begin at the intersection of the northern boundary of Mono County and the California state line at the point which is the center of Section 17, T10N, R22E, Mt. Diablo Meridian. Continue S then SE along the entire western boundary of Mono County, until it reaches Inyo County at the point which is the NE corner of the Western half of the NW quarter of Section 2, T8S, R29E, MDM. Continue SSE along the entire western boundary of Inyo County, until the intersection with Kern County at the point which is the SW corner of the SE 1/4 of Section 32, T24S, R37E, MDM. Continue E along the Inyo and Kern County boundary until the intersection with San Bernardino County at that point which is the SE corner of section 34, T24S, R40E, MDM. Continue E along the Inyo and San Bernardino County boundary until the point which is the NE corner of the Western half of the NW quarter of Section 6, T25S, R42E, MDM. Continue S to that point which is the SW corner of the NW quarter of Section 6, T27S, R42E, MDM. Continue E in a straight line to the California and Nevada state border at the point which is the NW corner of Section 1, T17N, R14E, San Bernardino Meridian. Then continue NW along the state line to the starting point, which is the center of Section 18, T10N, R22E, MDM.

REMAINING AREA NOT DEFINED ABOVE RECIEVES BASE RATE

ENGI0012-004 08/01/2015

	Rates	Fringes
OPERATOR: Power Equipment (DREDGING)		
(1) Leverman	$ 49.50	23.60
(2) Dredge dozer	$ 43.53	23.60
(3) Deckmate	$ 43.42	23.60
(4) Winch operator (stern winch on dredge)	$ 42.87	23.60
(5) Fireman-Oiler, Deckhand, Bargeman, Leveehand	$ 42.33	23.60
(6) Barge Mate	$ 42.94	23.60

IRON0377-002 07/01/2016

	Rates	Fringes
Ironworkers:		
Fence Erector	$ 28.33	20.64
Ornamental, Reinforcing and Structural	$ 34.75	29.20

PREMIUM PAY:

$6.00 additional per hour at the following locations:
China Lake Naval Test Station, Chocolate Mountains Naval Reserve-Niland,
Edwards AFB, Fort Irwin Military Station, Fort Irwin Training Center-Goldstone, San Clemente Island, San Nicholas Island, Susanville Federal Prison, 29 Palms - Marine Corps, U.S. Marine Base - Barstow, U.S. Naval Air Facility - Sealey, Vandenberg AFB

$4.00 additional per hour at the following locations:

Army Defense Language Institute - Monterey, Fallon Air Base, Naval Post Graduate School - Monterey, Yermo Marine Corps Logistics Center

$2.00 additional per hour at the following locations:

Port Hueneme, Port Mugu, U.S. Coast Guard Station - Two Rock

LABO0089-001 07/18/2016

	Rates	Fringes
LABORER (BUILDING and all other Residential Construction)		
Group 1	$ 29.42	19.78
Group 2	$ 30.10	19.78
Group 3	$ 30.81	19.78
Group 4	$ 31.61	19.78
Group 5	$ 33.54	19.78
LABORER (RESIDENTIAL CONSTRUCTION - See definition below)		
(1) Laborer	$ 27.32	18.11
(2) Cleanup, Landscape, Fencing (Chain Link & Wood)	$ 26.03	18.11

RESIDENTIAL DEFINITION: Wood or metal frame construction of single family residences, apartments and condominums - excluding (a) projects that exceed three stories over a garage level, (b) any utility work such as telephone, gas, water, sewer and other utilities and (c) any fine grading work, utility work or paving work in the future street and public right-of-way; but including all rough grading work at the job site behind the existing right of way

LABORER CLASSIFICATIONS

GROUP 1: Cleaning and handling of panel forms; Concrete Screeding for Rought Strike-off; Concrete, water curing; Demolition laborer; Flagman; Gas, oil and/or water pipeline laborer; General Laborer; General clean-up laborer; Landscape laborer; Jetting laborer; Temporary water and air lines laborer; Material hoseman (walls, slabs, floors and decks); Plugging, filling of Shee-bolt holes; Dry packing of concrete; Railroad maintenance, Repair Trackman and road beds, Streetcar and railroad construction trac laborers; Slip form raisers; Slurry seal crews (mixer operator, applicator operator, squeegee man, Shuttle man, top man), filling of cracks by any method on any surface; Tarman and mortar man; Tool crib or tool house laborer; Window cleaner; Wire Mesh puling-all concrete pouring operations

GROUP 2: Asphalt Shoveler; Cement Dumper (on 1 yard or larger mixer and handling bulk cement); Cesspool digger and installer; Chucktender; Chute man, pouring concrete, the handling of the cute from ready mix trucks, such as walls, slabs, decks, floors, foundations, footings, curbs, gutters and sidewalks; Concrete curer-impervious membrane and form oiler; Cutting torch operator (demoliton); Guinea chaser; Headboard man-asphlt; Laborer,
packing rod steel and pans; membrane vapor barrier installer; Power broom sweepers (small); Riiprap, stonepaver, placing stone or wet sacked concrete; Roto scraper and tiller; Tank sealer and cleaner; Tree climber, faller, chain saw operator, Pittsburgh Chipper and similar type brush shredders; Underground laborers, including caisson bellower

GROUP 3: Buggymobile; Concrete cutting torch; Concrete cutting torch; Concrete pile cutter; Driller, jackhammer, 2 1/2 feet drill steel or longer; Dri Pak-it machine; High sealer (including drilling of same); Hydro seeder and similar type; Impact wrench, mult-plate; Kettlemen, potmen and mean applying asphalt, lay-kold, creosote, line caustic and similar type materials (applying means applying, dipping, brushing or handling of such materials for pipe wrapping and waterproofing); Operators of pneumatic, gas, electric tools, vibratring machines, pavement breakers, air blasting, come-along, and similar mechanical tools not separately classified herein; Pipelayers back up man coating, grouting, making of joints, sealing, caulking, diapering and inclduing rubber gasket joints, pointing and any and all other services; Rotary Scarifier or multiple head concrete chipping scaarifier; Steel header board man and guideline setter; Tampers, Barko, Wacker and similar type; Trenching machine, handpropelled

GROUP 4: Asphalt raker, luterman, ironer, apshalt dumpman and asphalt spreader boxes (all types); Concrete core cutter (walls, floors or ceilings), Grinder or sander; Concrete saw man; cutting walls or flat work, scoring old or new concrete; Cribber, shorer, lagging, sheeting and trench

bracing, hand-guided lagging hammer; Laser beam in connection with laborer's work; Oversize concrete vibrator operator 70 pounds and over; Pipelayer performing all services in the laying, installation and all forms of connection of pipe from the point of receiving pipe in the ditch until completion of oepration, including any and all forms of tubular material, whether pipe, metallic or non-metallic, conduit, and any other stationary type of tubular device used for the conveying of any substance or element, whether water, sewage, solid, gas, air or other product whatsoever and without regard to the nature of material from which the tubular material is fabricated; No joint pipe and stripping of same; Prefabricated manhole installer; Sandblaster (nozzleman), Porta shot-blast, water blasting

GROUP 5: Blasters Powderman-All work of loading holes, placing and blasting of all pwder and explosives of whatever type, regardless of method used for such loading and placing; Driller-all power drills, excluding jackhammer, whether core, diamond, wagon, track, multiple unit, and any and all other types of mechanical drills without regard to the form of motive power.

LABO0089-002 11/01/2016

	Rates	Fringes
LABORER (MASON TENDER)	$ 29.62	15.89

LABO0089-004 07/03/2016

HEAVY AND HIGHWAY CONSTRUCTION

	Rates	Fringes
Laborers:		
Group 1	$ 30.54	17.89
Group 2	$ 31.00	17.89
Group 3	$ 31.41	17.89
Group 4	$ 32.25	17.89
Group 5	$ 36.37	17.89

LABORER CLASSIFICATIONS

GROUP 1: Laborer: General or Construction Laborer, Landscape Laborer. Asphalt Rubber Material Loader. Boring Machine Tender (outside), Carpenter Laborer (cleaning, handling, oiling & blowing of panel forms and lumber), Concrete Laborer, Concrete Screeding for rough strike-off, Concrete water curing. Concrete Curb & Gutter laborer, Certified Confined Space Laborer, Demolition laborer & Cleaning of Brick and lumber,Expansion Joint Caulking; Environmental Remediation, Monitoring Well, Toxic waste and Geotechnical Drill tender, Fine Grader, Fire Watcher, Limbers, Brush Loader, Pilers and Debris Handlers. flagman. Gas Oil and Water Pipeline Laborer. Material Hoseman (slabs, walls, floors, decks); Plugging, filling of shee bolt holes; Dry

packing of concrete and patching; Post Holer Digger (manual); Railroad maintenance, repair trackman, road beds; Rigging & signaling; Scaler, Slip-Form Raisers, Filling cracks on any surface, tool Crib or Tool House Laborer, Traffic control (signs, barriers, barricades, delineator, cones etc.), Window Cleaner

GROUP 2: Asphalt abatement; Buggymobile; Cement dumper (on 1 yd. or larger mixers and handling bulk cement); Concrete curer, impervious membrane and form oiler; Chute man, pouring concrete; Concrete cutting torch; Concrete pile cutter; driller/Jackhammer, with drill steel 2 1/'2 feet or longer; Dry pak-it machine; Fence erector; Pipeline wrapper, gas, oil, water, pot tender & form man; Grout man; Installation of all asphalt overlay fabric and materials used for reinforcing asphalt; Irrigation laborer; Kettleman-Potman hot mop, includes applying asphalt, lay-klold, creosote, lime caustic and similar tyhpes of materials (dipping, brushing, handling) and waterproofing; Membrane vapor barrier installer; Pipelayer backup man (coating, grouting, making of joints, sealing caulkiing, diapering including rubber basket joints, pointing); Rotary scarifier, multiple head concrete chipper; Rock slinger; Roto scraper & tiller; Sandblaster pot tender; Septic tank digger/installer; Tamper/wacker operator; Tank scaler & cleaner; Tar man & mortar man; Tree climber/faller, chainb saw operator, Pittsburgh chipper & similar type brush shredders.

GROUP 3: Asphalt, installation of all frabrics; Buggy Mobile Man, Bushing hammer; Compactor (all types), Concrete Curer - Impervious membrane, Form Oiler, Concrete Cutting Torch, Concrete Pile Cutter,Driller/Jackhammer with drill steel 2 1/2 ft or longer, Dry Pak-it machine, Fence erector including manual post hole digging, Gas oil or water Pipeline Wrapper - 6 ft pipe and over, Guradrail erector, Hydro seeder, Impact Wrench man (multi plate), kettleman-Potman Hot Mop includes applying Asphalt, Lay-Kold, Creosote, lime caustic and similar types of materials (dipping, brushing or handling) and waterproofing. Laser Beam in connection with Laborer work. High Scaler, Operators of Pneumatic Gas or Electric Tools, Vibrating Machines, Pavement Breakers, Air Blasting, Come-Alongs and similar mechanical tools, Remote-Controlled Robotic Tools in connection with Laborers work. Pipelayer Backup Man (Coating, grouting,m makeing of joints, sealing, caulking, diapering including rubber gasket joints, pointing and other services). Power Post Hole Digger, Rotary Scarifier (multiple head concrete chipper scarifier), Rock Slinger, Shot Blast equipment (8 to 48 inches), Steel Headerboard Man and Guideline Setter, Tamper/Wacker operator and similar types, Trenching Machine hand propelled.

GROUP 4: Any worker exposed to raw sewage. Asphalt Raker, Luteman, Asphalt Dumpman, Asphalt Spreader Boxes, Concrete Core Cutter, Concrete Saw Man, Cribber, Shorer, Head Rock Slinger. Installation of subsurface instrumentation,

monitoring wells or points, remediation system installer; Laborer, asphalt-rubber distributor bootman; Oversize concrete vibrator operators, 70 pounds or over. Pipelayer, Prfefabricated Manhole Installer, Sandblast Nozzleman (Water Balsting-Porta Shot Blast), Traffic Lane Closure.

GROUP 5: Blasters Powderman-All work of loading holes, placing and blasting of all powder and explosives of whatever type, regardless of method used for such loading and placing; Horizontal directional driller, Boring system, Electronic traking, Driller: all power drills excluding jackhammer, whether core, diamond, wagon, track, multiple unit, and all other types of mechanical drills without regard to form of motive power. Environmental remediation, Monitoring well, Toxic waste and Geotechnical driller, Toxic waste removal. Welding in connection with Laborer's work.

LABO0300-005 01/01/2016

	Rates	Fringes
Asbestos Removal Laborer.....	$ 30.43	16.07

SCOPE OF WORK: Includes site mobilization, initial site cleanup, site preparation, removal of asbestos-containing material and toxic waste, encapsulation, enclosure and disposal of asbestos- containing materials and toxic waste by hand or with equipment or machinery; scaffolding, fabrication of temporary wooden barriers and assembly of decontamination stations.

LABO1184-001 07/04/2016

	Rates	Fringes
Laborers: (HORIZONTAL DIRECTIONAL DRILLING)		
(1) Drilling Crew Laborer...	$ 33.65	13.95
(2) Vehicle Operator/Hauler.	$ 33.82	13.95
(3) Horizontal Directional Drill Operator.....	$ 35.67	13.95
(4) Electronic Tracking Locator.....	$ 37.67	13.95
Laborers: (STRIPING/SLURRY SEAL)		
GROUP 1.....	$ 34.86	17.03
GROUP 2.....	$ 36.16	17.03
GROUP 3.....	$ 38.17	17.03
GROUP 4.....	$ 39.91	17.03

LABORERS - STRIPING CLASSIFICATIONS

GROUP 1: Protective coating, pavement sealing, including repair and filling of cracks by any method on any surface in parking lots, game courts and playgrounds; carstops; operation of all related machinery and equipment; equipment

repair technician

GROUP 2: Traffic surface abrasive blaster; pot tender - removal of all traffic lines and markings by any method (sandblasting, waterblasting, grinding, etc.) and preparation of surface for coatings. Traffic control person: controlling and directing traffic through both conventional and moving lane closures; operation of all related machinery and equipment

GROUP 3: Traffic delineating device applicator: Layout and application of pavement markers, delineating signs, rumble and traffic bars, adhesives, guide markers, other traffic delineating devices including traffic control. This category includes all traffic related surface preparation (sandblasting, waterblasting, grinding) as part of the application process. Traffic protective delineating system installer: removes, relocates, installs, permanently affixed roadside and parking delineation barricades, fencing, cable anchor, guard rail, reference signs, monument markers; operation of all related machinery and equipment; power broom sweeper

GROUP 4: Striper: layout and application of traffic stripes and markings; hot thermo plastic; tape traffic stripes and markings, including traffic control; operation of all related machinery and equipment

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LABO1414-003 08/03/2016

	Rates	Fringes
LABORER		
PLASTER CLEAN-UP LABORER	$ 31.60	19.28
PLASTER TENDER	$ 34.15	19.28

Work on a swing stage scaffold: $1.00 per hour additional.

Work at Military Bases - $3.00 additional per hour:
Coronado Naval Amphibious Base, Fort Irwin, Marine Corps Air Station-29 Palms, Imperial Beach Naval Air Station, Marine Corps Logistics Supply Base, Marine Corps Pickle Meadows, Mountain Warfare Training Center, Naval Air Facility-Seeley, North Island Naval Air Station, Vandenberg AFB.

PAIN0036-001 07/01/2015

	Rates	Fringes
Painters: (Including Lead Abatement)		
(1) Repaint (excludes San Diego County)	$ 27.29	12.83
(2) All Other Work	$ 30.72	12.83

REPAINT of any previously painted structure. Exceptions: work involving the aerospace industry, breweries, commercial recreational facilities, hotels which operate commercial establishments as part of hotel service, and sports facilities.

PAIN0036-010 10/01/2015

	Rates	Fringes
DRYWALL FINISHER/TAPER		
(1) Building & Heavy Construction	$ 27.84	15.20
(2) Residential Construction (Wood frame apartments, single family homes and multi-duplexes up to and including four stories)	$ 21.00	13.91

PAIN0036-012 10/01/2016

	Rates	Fringes
GLAZIER	$ 41.55	11.93

PAIN0036-019 01/01/2016

	Rates	Fringes
SOFT FLOOR LAYER	$ 26.77	13.53

PLAS0200-005 08/06/2015

	Rates	Fringes
PLASTERER	$ 38.44	13.77

NORTH ISLAND NAVAL AIR STATION, COLORADO NAVAL AMPHIBIOUS BASE, IMPERIAL BEACH NAVAL AIR STATION: $3.00 additional per hour.

PLAS0500-001 07/01/2016

	Rates	Fringes
CEMENT MASON/CONCRETE FINISHER		
GROUP 1	$ 23.84	21.17
GROUP 2	$ 25.49	21.17
GROUP 3	$ 27.57	21.17

CEMENT MASONS - work inside the building line, meeting the following criteria:

GROUP 1: Residential wood frame project of any size; work classified as Type III, IV or Type V construction;

interior tenant improvement work regardless the size of the project; any wood frame project of four stories or less.

GROUP 2: Work classified as type I and II construction

GROUP 3: All other work

PLUM0016-006 07/01/2016

	Rates	Fringes
PLUMBER, PIPEFITTER, STEAMFITTER		
Camp Pendleton	$ 51.69	21.41
Plumber and Pipefitter All other work except work on new additions and remodeling of bars, restaurant, stores and commercial buildings not to exceed 5,000 sq. ft. of floor space and work on strip malls, light commercial, tenant improvement and remodel work	$ 47.19	21.41
Work ONLY on new additions and remodeling of commercial buildings, bars, restaurants, and stores not to exceed 5,000 sq. ft. of floor space	$ 45.73	20.43
Work ONLY on strip malls, light commercial, tenant improvement and remodel work	$ 35.69	18.76

PLUM0016-011 07/01/2016

	Rates	Fringes
PLUMBER/PIPEFITTER		
Residential	$ 38.17	17.33

PLUM0345-001 07/01/2014

	Rates	Fringes
PLUMBER		
Landscape/Irrigation Fitter	$ 29.27	19.75
Sewer & Storm Drain Work	$ 33.24	17.13

ROOF0045-001 07/01/2012

	Rates	Fringes
ROOFER	$ 25.08	7.28

SFCA0669-001 04/01/2016

	Rates	Fringes
SPRINKLER FITTER	$ 37.67	19.56

SHEE0206-001 07/01/2015

	Rates	Fringes
SHEET METAL WORKER		
Camp Pendleton	$ 37.55	23.23
Except Camp Pendleton	$ 35.33	23.23
Sheet Metal Technician	$ 25.22	6.69

SHEET METAL TECHNICIAN - SCOPE:
a. Existing residential buildings, both single and multi-family, where each unit is heated and/or cooled by a separate system b. New single family residential buildings including tracts. c. New multi-family residential buildings, not exceeding five stories of living space in height, provided each unit is heated or cooled by a separate system. Hotels and motels are excluded. d. LIGHT COMMERCIAL WORK: Any sheet metal, heating and air conditioning work performed on a project where the total construction cost, excluding land, is under $1,000,000 e. TENANT IMPROVEMENT WORK: Any work necessary to finish interior spaces to conform to the occupants of commercial buildings, after completion of the building shell

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TEAM0036-001 07/04/2016

	Rates	Fringes
Truck drivers:		
GROUP 1	$ 15.90	30.69
GROUP 2	$ 23.49	30.69
GROUP 3	$ 23.69	30.69
GROUP 4	$ 23.89	30.69
GROUP 5	$ 24.09	30.69
GROUP 6	$ 24.59	30.69
GROUP 7	$ 26.09	30.69

FOOTNOTE: HAZMAT PAY: Work on a hazmat job, where hazmat certification is required, shall be paid, in addition to the classification working in, as follows: Levels A, B and C - +$1.00 per hour. Workers shall be paid hazmat pay in increments of four (4) and eight (8) hours.

TRUCK DRIVER CLASSIFICATIONS

GROUP 1: Fuel Man, Swamper

GROUP 2: 2-axle Dump Truck, 2-axle Flat Bed,Concrete Pumping Truck, Industrial Lift Truck, Motorized Traffic Control, Pickup Truck on Jobsite

GROUP 3: 2-axle Water Truck, 3-axle Dump Truck, 3-axle Flat Bed, Erosion Control Nozzleman, Dump Crete Truck under 6.5 yd, Forklift 15,000 lbs and over, Prell Truck, Pipeline Work Truck Driver, Road Oil Spreader, Cement Distributor or Slurry Driver, Bootman, Ross Carrier

GROUP 4: Off-road Dump Truck under 35 tons 4-axles but less than 7-axles, Low-Bed Truck & Trailer, Transit Mix Trucks

under 8 yd, 3-axle Water Truck, Erosion Control Driver, Grout Mixer Truck, Dump Crete 6.5yd and over, Dumpster Trucks, DW 10, DW 20 and over, Fuel Truck and Dynamite, Truck Greaser, Truck Mounted Mobile Sweeper 2-axle Winch Truck

GROUP 5: Off-road Dump Truck 35 tons and over, 7-axles or more, Transit Mix Trucks 8 yd and over, A-Frame Truck, Swedish Cranes

GROUP 6: Off-Road Special Equipment (including but not limited to Water Pull Tankers, Athey Wagons, DJB, B70 Wuclids or like Equipment)

GROUP 7: Repairman

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

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Note: Executive Order (EO) 13706, Establishing Paid Sick Leave for Federal Contractors applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2017. If this contract is covered by the EO, the contractor must provide employees with 1 hour of paid sick leave for every 30 hours they work, up to 56 hours of paid sick leave each year. Employees must be permitted to use paid sick leave for their own illness, injury or other health-related needs, including preventive care; to assist a family member (or person who is like family to the employee) who is ill, injured, or has other health-related needs, including preventive care; or for reasons resulting from, or to assist a family member (or person who is like family to the employee) who is a victim of, domestic violence, sexual assault, or stalking. Additional information on contractor requirements and worker protections under the EO is available at www.dol.gov/whd/govcontracts.

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (ii)).

The body of each wage determination lists the classification and wage rates that have been found to be prevailing for the cited type(s) of construction in the area covered by the wage determination. The classifications are listed in alphabetical order of "identifiers" that indicate whether the particular rate is a union rate (current union negotiated rate for local), a survey rate (weighted average rate) or a union average rate (weighted union average rate).

Union Rate Identifiers

A four letter classification abbreviation identifier enclosed in dotted lines beginning with characters other than "SU" or "UAVG" denotes that the union classification and rate were prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2014. PLUM is an abbreviation identifier of the union which prevailed in the survey for this classification, which in this example would be Plumbers. 0198

indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. 07/01/2014 is the effective date of the most current negotiated rate, which in this example is July 1, 2014.

Union prevailing wage rates are updated to reflect all rate changes in the collective bargaining agreement (CBA) governing this classification and rate.

Survey Rate Identifiers

Classifications listed under the "SU" identifier indicate that no one rate prevailed for this classification in the survey and the published rate is derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As this weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SULA2012-007 5/13/2014. SU indicates the rates are survey rates based on a weighted average calculation of rates and are not majority rates. LA indicates the State of Louisiana. 2012 is the year of survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. 5/13/2014 indicates the survey completion date for the classifications and rates under that identifier.

Survey wage rates are not updated and remain in effect until a new survey is conducted.

Union Average Rate Identifiers

Classification(s) listed under the UAVG identifier indicate that no single majority rate prevailed for those classifications; however, 100% of the data reported for the classifications was union data. EXAMPLE: UAVG-OH-0010 08/29/2014. UAVG indicates that the rate is a weighted union average rate. OH indicates the state. The next number, 0010 in the example, is an internal number used in producing the wage determination. 08/29/2014 indicates the survey completion date for the classifications and rates under that identifier.

A UAVG rate will be updated once a year, usually in January of each year, to reflect a weighted average of the current negotiated/CBA rate of the union locals from which the rate is based.

WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can be:

* an existing published wage determination
* a survey underlying a wage determination
* a Wage and Hour Division letter setting forth a position on a wage determination matter
* a conformance (additional classification and rate) ruling

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour Regional Office for the area in which the survey was conducted

because those Regional Offices have responsibility for the Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:

Branch of Construction Wage Determinations
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

2.) If the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

Wage and Hour Administrator
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3.) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

4.) All decisions by the Administrative Review Board are final.

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END OF GENERAL DECISION

CONTRACT AGREEMENT

CONSTRUCTION CONTRACT

This contract is made and entered into between THE CITY OF SAN DIEGO, a municipal corporation, herein called "City", and _____, herein called "Contractor" for construction of **69th & Mohawk Pump Station**; Bid No. **K-17-1401-DBB-3**; in the amount of _____ ($ _____), which is comprised of the Base Bid plus/minus Additive/Deductive Alternates _____.

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) Phased Funding Schedule Agreement.

   (e) That certain documents entitled **69th & Mohawk Pump Station** on file in the office of the Public Works Department as Document No. **S-12011**, 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 **69th & Mohawk Pump Station,** Bid Number **K-17-1401-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.

IN WITNESS WHEREOF, this Agreement is signed by the City of San Diego, acting by and through its Mayor or designee, pursuant to Resolution No. R - _____ or Municipal Code _____authorizing such execution.

THE CITY OF SAN DIEGO

By_____

Print Name: _____
Mayor or designee

Date:_____

APPROVED AS TO FORM

Mara W. Elliott, City Attorney

By_____

Print Name:_____
Deputy City Attorney

Date:_____

CONTRACTOR

By_____

Print Name:_____

Title:_____

Date:_____

City of San Diego License No.:_____

State Contractor's License No.:_____

DEPARTMENT OF INDUSTRIAL RELATIONS (DIR) REGISTRATION NUMBER: _____

City of San Diego

CITY CONTACT: Michelle Muñoz, Contract Specialist, **Email:** MichelleM@sandiego.gov
Phone No. (619) 533-3482, **Fax No.** (619) 533-3633

ADDENDUM "F"

e - Bidding **FOR**

69TH & Mohawk Pump Station

BID NO.:	**K-17-1401-DBB-3**
SAP NO. (WBS/IO/CC):	**S-12011**
CLIENT DEPARTMENT:	**2000**
COUNCIL DISTRICT:	**9**
PROJECT TYPE:	**BJ**

BID DUE DATE:

2:00 PM
FEBRUARY 23, 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.

THE SUBMITTAL DATE FOR THIS PROJECT HAS BEEN **EXTENDED AS STATED ON THE COVER PAGE.**

James Nagelvoort, Director
Public Works Department

Dated: *January 23, 2017*
San Diego, California

JN/AJ/egz

City of San Diego

CITY CONTACT: Michelle Muñoz, Contract Specialist, **Email:** MichelleM@sandiego.gov
Phone No. (619) 533-3482, **Fax No.** (619) 533-3633

ADDENDUM "G"

e - Bidding **FOR**

69TH & Mohawk Pump Station

BID NO.:	**K-17-1401-DBB-3**
SAP NO. (WBS/IO/CC):	**S-12011**
CLIENT DEPARTMENT:	**2000**
COUNCIL DISTRICT:	**9**
PROJECT TYPE:	**BJ**

BID DUE DATE:

2:00 PM
FEBRUARY 23, 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

The original contract specification on page 74, section 7, section C #2 stated the contractor has 30 days to post solicitations; and page 76, section 12.3 stated the contractor shall provide documentation that the local SBA/MBDA offices or web sites were notified of the bid opportunity at least 15 working days prior to bid opening and solicitation to DBE subcontractors at least 10 working days prior to bid opening. Then in Addendum A, B. A3 changed the original specification to, The minimum number of days to post solicitations for bids or proposals will be changed form 30 days to 15 working days on page 74, item 7, sub item c2. The contractor is to provide documentation that the local SBA/MBDA offices or websites were notified of the contracting bid opportunity at least 15 working days prior to the bid opening. Solicitation to potential DBE subcontractors must be sent at least 10 working days prior to bid opening. Refer to Section 12.3 of Attachment D.

Q1. My first question is since the contract bid date has moved four times from the original bid date. How many times do we need to solicit DBE subcontractors and post to the SBA/MBDA websites, because according to addendum A, B. A3 it states AT least 15 working days to post solicitation and AT least 10 working days to solicit potential DBE subcontractors prior to bid opening. **So do we need to solicit and post again for the new bid opening of February 23, 2017?**

A1. The Contractor shall post subcontractor opportunities at least 15 Working Days prior to bid opening.

The contractor shall ensure DBEs are made aware of contracting opportunities to the fullest extent practicable through outreach and recruitment activities as well as make information on forthcoming opportunities available to DBEs and arrange time frames for contracts and establish delivery schedules, where the requirements permit, in a way that encourages and facilitates participation by DBEs in the competitive process. This includes, whenever possible, posting solicitations for bids or proposals for a minimum of 15 working days before the bid or proposal closing date.

Contractors are encouraged to update their solicitations with the new bid opening date to show they are making a good faith effort by informing and recruiting interested DBE subcontractors for opportunities on this contract.

Q2. My second question refers to the original specifications page 75, section D, 11.2.2, 3. It states the apparent low bidder shall submit documentation showing that, prior to bid opening, the required GFE was made. The documentation shall be received by the city within 4 working days following bid opening, except the DBE information form, which is to be submitted with the bid. Failure to submit DBE information form will cause the bid to be rejected as non-responsive. **So is this still correct that only the apparent low bidder needs to submit documentation 4 working days following the bid opening showing that prior to the bid opening the required GFE was made?**

A2. Submission of Good Faith Effort documentation is a mandatory condition for **ALL Bidders.** Please refer to the mandatory conditions listed on page six in section 7.7, Item 7.7.3.

C. ADDENDUM

1. To Addendum E, page 8, Section C, Addendum, Item 1, **DELETE** "Section 9, Wage Rates, pages 9 through 34", in their entirety and **SUBSTITUTE** with pages 4 through 30 of this Addendum.

D. ATTACHMENTS

1. To Attachment D, Safe Drinking Water State Revolving Fund (SDWSRF) Funding Agency Provisions, page 75, Section 11, Agency Specific Provisions, Sub-section 11.2., Annual DBE Utilization Reporting, Item 11.2.2., Number 3, **DELETE** in its entirety and **SUBSTITUTE** with the following:

    3. All bidders shall submit documentation showing that, prior to Bid opening, the required GFE was made. The documentation shall be received by the City within 4 Working Days following Bid opening, except the Disadvantaged Business Enterprise Information Form, which is to be submitted with the Bid. Failure to submit Disadvantaged Business Enterprise Information Form with the Bid will cause the Bid to be rejected as non-responsive.

James Nagelvoort, Director
Public Works Department

Dated: *February 7, 2017*
San Diego, California

JN/AJ/egz

9. WAGE RATES: This contract shall be subject to the following Davis-Bacon Wage Decisions:

General Decision Number: CA170001 01/27/2017 CA1

Superseded General Decision Number: CA20160001

State: California

Construction Types: Building, Heavy (Heavy and Dredging), Highway and Residential

County: San Diego County in California.

BUILDING CONSTRUCTION PROJECTS; DREDGING PROJECTS (does not include hopper dredge work); HEAVY CONSTRUCTION PROJECTS (does not include water well drilling); HIGHWAY CONSTRUCTION PROJECTS; RESIDENTIAL CONSTRUCTION PROJECTS (consisting of single family homes and apartments up to and including 4 stories)

Note: Under Executive Order (EO) 13658, an hourly minimum wage of $10.20 for calendar year 2017 applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2015. If this contract is covered by the EO, the contractor must pay all workers in any classification listed on this wage determination at least $10.20 (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract in calendar year 2017. The EO minimum wage rate will be adjusted annually. Additional information on contractor requirements and worker protections under the EO is available at www.dol.gov/whd/govcontracts.

Modification Number	Publication Date
0	01/06/2017
1	01/27/2017

ASBE0005-002 07/04/2016

	Rates	Fringes
Asbestos Workers/Insulator (Includes the application of all insulating materials, protective coverings, coatings, and finishes to all types of mechanical systems)	$ 38.37	20.13
Fire Stop Technician (Application of Firestopping Materials for wall openings and penetrations in walls, floors, ceilings and curtain walls)	$ 26.15	17.31

ASBE0005-004 07/04/2016

	Rates	Fringes
Asbestos Removal worker/hazardous material handler (Includes preparation, wetting, stripping, removal, scrapping, vacuuming, bagging and disposing of all insulation materials from mechanical systems, whether they contain asbestos or not)	$ 18.38	10.82

BOIL0092-003 10/01/2012

	Rates	Fringes
BOILERMAKER	$ 41.17	28.27

BRCA0004-008 11/01/2016

	Rates	Fringes
BRICKLAYER; MARBLE SETTER	$ 35.30	17.35

BRCA0018-004 06/01/2016

	Rates	Fringes
MARBLE FINISHER	$ 29.20	12.93
TILE FINISHER	$ 24.53	11.08
TILE LAYER	$ 35.89	9.08

BRCA0018-010 09/01/2016

	Rates	Fringes
TERRAZZO FINISHER	$ 28.53	12.27

TERRAZZO WORKER/SETTER.....$ 35.57 13.14

CARP0409-002 07/01/2008

	Rates	Fringes
Diver		
(1) Wet	$ 663.68	9.82
(2) Standby	$ 331.84	9.82
(3) Tender	$ 323.84	9.82
(4) Assistant Tender	$ 299.84	9.82

Amounts in "Rates' column are per day

CARP0409-008 08/01/2010

	Rates	Fringes
Modular Furniture Installer	$ 17.00	7.41

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* CARP0547-001 07/01/2016

	Rates	Fringes
CARPENTER		
(1) Bridge	$ 37.28	10.58
(2) Commercial Building	$ 32.30	10.58
(3) Heavy & Highway	$ 37.15	10.58
(4) Residential Carpenter	$ 25.84	10.58
(5) Residential Insulation Installer	$ 18.00	8.16
MILLWRIGHT	$ 40.70	17.03
PILEDRIVERMAN	$ 37.28	10.58

CARP0547-002 07/01/2009

	Rates	Fringes
Drywall		
(1) Work on wood framed construction of single family residences, apartments or condominiums under four stories		
Drywall Installer/Lather	$ 21.00	8.58
Drywall Stocker/Scrapper	$ 11.00	6.67
(2) All other work		
Drywall Installer/Lather	$ 27.35	9.58
Drywall Stocker/Scrapper	$ 11.00	6.67

ELEC0569-001 10/01/2016

	Rates	Fringes
Electricians (Tunnel Work)		
Cable Splicer	$ 47.72	3%+12.63
Electrician	$ 46.97	3%+12.63

Electricians: (All Other
Work, Including 4 Stories
Residential)
Cable Splicer.....$ 42.50 3%+12.63
Electrician.....$ 41.75 3%+12.63

ELEC0569-004 06/01/2015

	Rates	Fringes
ELECTRICIAN (Sound & Communications Sound Technician).....	$ 29.55	11.92

SOUND TECHNICIAN: Terminating, operating and performing final check-out

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ELEC0569-005 06/06/2016

	Rates	Fringes
Sound & Communications		
Sound Technician.....	$ 30.22	12.21

SOUND TECHNICIAN: Terminating, operating and performing final check-out

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ELEC0569-006 10/05/2015

Work on street lighting; traffic signals; and underground systems and/or established easements outside of buildings

	Rates	Fringes
Traffic signal, street light and underground work		
Utility Technician #1.....	$ 29.50	8.31
Utility Technician #2.....	$ 24.65	8.16

STREET LIGHT & TRAFFIC SIGNAL WORK:

UTILITY TECHNICIAN #1: Installation of street lights and traffic signals, including electrical circuitry, programmable controller, pedestal-mounted electrical meter enclosures and laying of pre-assembled cable in ducts. The layout of electrical systems and communication installation including proper position of trench depths, and radius at duct banks, location for manholes, street lights and traffic signals.

UTILITY TECHNICIAN #2: Distribution of material at jobsite, installation of underground ducts for electrical, telephone, cable TV land communication systems. The setting, leveling, grounding and racking of precast manholes, handholes and transformer pads.

ELEC0569-008 06/06/2016

	Rates	Fringes
ELECTRICIAN (Residential, 1-3 Stories)	$ 31.69	3%+6.61

ELEC1245-001 06/01/2015

	Rates	Fringes
LINE CONSTRUCTION		
(1) Lineman; Cable splicer	$ 52.85	15.53
(2) Equipment specialist (operates crawler tractors, commercial motor vehicles, backhoes, trenchers, cranes (50 tons and below), overhead & underground distribution line equipment)	$ 42.21	14.32
(3) Groundman	$ 32.28	14.03
(4) Powderman	$ 47.19	14.60

HOLIDAYS: New Year's Day, M.L. King Day, Memorial Day, Independence Day, Labor Day, Veterans Day, Thanksgiving Day and day after Thanksgiving, Christmas Day

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* ELEV0018-001 01/01/2017

	Rates	Fringes
ELEVATOR MECHANIC	$ 52.21	31.585

FOOTNOTE:
PAID VACATION: Employer contributes 8% of regular hourly rate as vacation pay credit for employees with more than 5 years of service, and 6% for 6 months to 5 years of service.
PAID HOLIDAYS: New Years Day, Memorial Day, Independence Day, Labor Day, Veterans Day, Thanksgiving Day, Friday after Thanksgiving, and Christmas Day.

ENGI0012-003 07/01/2016

	Rates	Fringes
OPERATOR: Power Equipment (All Other Work)		
GROUP 1	$ 39.95	23.35
GROUP 2	$ 40.73	23.35
GROUP 3	$ 41.02	23.35
GROUP 4	$ 42.51	23.35
GROUP 5	$ 41.86	23.35
GROUP 6	$ 41.83	23.35

GROUP 8	$ 42.84	23.35
GROUP 9	$ 42.19	23.35
GROUP 10	$ 42.96	23.35
GROUP 11	$ 42.31	23.35
GROUP 12	$ 43.13	23.35
GROUP 13	$ 43.23	23.35
GROUP 14	$ 43.26	23.35
GROUP 15	$ 43.34	23.35
GROUP 16	$ 43.46	23.35
GROUP 17	$ 43.63	23.35
GROUP 18	$ 43.73	23.35
GROUP 19	$ 43.84	23.35
GROUP 20	$ 43.96	23.35
GROUP 21	$ 44.13	23.35
GROUP 22	$ 44.23	23.35
GROUP 23	$ 44.34	23.35
GROUP 24	$ 44.46	23.35
GROUP 25	$ 44.63	23.35
OPERATOR: Power Equipment (Cranes, Piledriving & Hoisting)		
GROUP 1	$ 43.20	22.15
GROUP 2	$ 43.98	22.15
GROUP 3	$ 44.27	22.15
GROUP 4	$ 44.41	22.15
GROUP 5	$ 44.63	22.15
GROUP 6	$ 44.74	22.15
GROUP 7	$ 44.86	22.15
GROUP 8	$ 45.03	22.15
GROUP 9	$ 45.20	22.15
GROUP 10	$ 46.20	22.15
GROUP 11	$ 47.20	22.15
GROUP 12	$ 48.20	22.15
GROUP 13	$ 49.20	22.15
OPERATOR: Power Equipment (Tunnel Work)		
GROUP 1	$ 41.80	23.35
GROUP 2	$ 42.58	23.35
GROUP 3	$ 42.87	23.35
GROUP 4	$ 43.01	23.35
GROUP 5	$ 43.23	23.35
GROUP 6	$ 43.34	23.35
GROUP 7	$ 43.46	23.35

PREMIUM PAY:

$3.75 per hour shall be paid on all Power Equipment Operator work on the followng Military Bases: China Lake Naval Reserve, Vandenberg AFB, Point Arguello, Seely Naval Base, Fort Irwin, Nebo Annex Marine Base, Marine Corp Logistics Base Yermo, Edwards AFB, 29 Palms Marine Base and Camp Pendleton

Workers required to suit up and work in a hazardous material environment: $2.00 per hour additional. Combination mixer and compressor operator on gunite work shall be classified as a concrete mobile mixer operator.

SEE ZONE DEFINITIONS AFTER CLASSIFICATIONS

POWER EQUIPMENT OPERATORS CLASSIFICATIONS

GROUP 1: Bargeman; Brakeman; Compressor operator; Ditch Witch, with seat or similar type equipment; Elevator operator-inside; Engineer Oiler; Forklift operator (includes loed, lull or similar types under 5 tons; Generator operator; Generator, pump or compressor plant operator; Pump operator; Signalman; Switchman

GROUP 2: Asphalt-rubber plant operator (nurse tank operator); Concrete mixer operator-skip type; Conveyor operator; Fireman; Forklift operator (includes loed, lull or similar types over 5 tons; Hydrostatic pump operator; oiler crusher (asphalt or concrete plant); Petromat laydown machine; PJU side dum jack; Screening and conveyor machine operator (or similar types); Skiploader (wheel type up to 3/4 yd. without attachment); Tar pot fireman; Temporary heating plant operator; Trenching machine oiler

GROUP 3: Asphalt-rubber blend operator; Bobcat or similar type (Skid steer); Equipment greaser (rack); Ford Ferguson (with dragtype attachments); Helicopter radioman (ground); Stationary pipe wrapping and cleaning machine operator

GROUP 4: Asphalt plant fireman; Backhoe operator (mini-max or similar type); Boring machine operator; Boxman or mixerman (asphalt or concrete); Chip spreading machine operator; Concrete cleaning decontamination machine operator; Concrete Pump Operator (small portable); Drilling machine operator, small auger types (Texoma super economatic or similar types - Hughes 100 or 200 or similar types - drilling depth of 30' maximum); Equipment greaser (grease truck); Guard rail post driver operator; Highline cableway signalman; Hydra-hammer-aero stomper; Micro Tunneling (above ground tunnel); Power concrete curing machine operator; Power concrete saw operator; Power-driven jumbo form setter operator; Power sweeper operator; Rock Wheel Saw/Trencher; Roller operator (compacting); Screed operator (asphalt or concrete); Trenching machine operator (up to 6 ft.); Vacuum or much truck

GROUP 5: Equipment Greaser (Grease Truck/Multi Shift).

GROUP 6: Articulating material hauler; Asphalt plant engineer; Batch plant operator; Bit sharpener; Concrete joint machine operator (canal and similar type); Concrete planer operator; Dandy digger; Deck engine operator; Derrickman (oilfield type); Drilling machine operator, bucket or auger types (Calweld 100 bucket or similar types - Watson 1000 auger or similar types - Texoma 330, 500 or 600 auger or similar types - drilling depth of 45' maximum); Drilling machine operator; Hydrographic seeder machine operator (straw, pulp or seed), Jackson track maintainer, or similar type; Kalamazoo Switch tamper, or similar type; Machine tool operator; Maginnis internal full

slab vibrator, Mechanical berm, curb or gutter(concrete or asphalt); Mechanical finisher operator (concrete, Clary-Johnson-Bidwell or similar); Micro tunnel system (below ground); Pavement breaker operator (truck mounted); Road oil mixing machine operator; Roller operator (asphalt or finish), rubber-tired earth moving equipment (single engine, up to and including 25 yds. struck); Self-propelled tar pipelining machine operator; Skiploader operator (crawler and wheel type, over 3/4 yd. and up to and including 1-1/2 yds.); Slip form pump operator (power driven hydraulic lifting device for concrete forms); Tractor operator-bulldozer, tamper-scraper (single engine, up to 100 h.p. flywheel and similar types, up to and including D-5 and similar types); Tugger hoist operator (1 drum); Ultra high pressure waterjet cutting tool system operator; Vacuum blasting machine operator

GROUP 8: Asphalt or concrete spreading operator (tamping or finishing); Asphalt paving machine operator (Barber Greene or similar type); Asphalt-rubber distribution operator; Backhoe operator (up to and including 3/4 yd.), small ford, Case or similar; Cast-in-place pipe laying machine operator; Combination mixer and compressor operator (gunite work); Compactor operator (self-propelled); Concrete mixer operator (paving); Crushing plant operator; Drill Doctor; Drilling machine operator, Bucket or auger types (Calweld 150 bucket or similar types - Watson 1500, 2000 2500 auger or similar types - Texoma 700, 800 auger or similar types - drilling depth of 60' maximum); Elevating grader operator; Grade checker; Gradall operator; Grouting machine operator; Heavy-duty repairman; Heavy equipment robotics operator; Kalamazoo balliste regulator or similar type; Kolman belt loader and similar type; Le Tourneau blob compactor or similar type; Loader operator (Athey, Euclid, Sierra and similar types); Mobark Chipper or similar; Ozzie padder or similar types; P.C. slot saw; Pneumatic concrete placing machine operator (Hackley-Presswell or similar type); Pumpcrete gun operator; Rock Drill or similar types; Rotary drill operator (excluding caisson type); Rubber-tired earth-moving equipment operator (single engine, caterpillar, Euclid, Athey Wagon and similar types with any and all attachments over 25 yds. up to and including 50 cu. yds. struck); Rubber-tired earth-moving equipment operator (multiple engine up to and including 25 yds. struck); Rubber-tired scraper operator (self-loading paddle wheel type-John Deere, 1040 and similar single unit); Self-propelled curb and gutter machine operator; Shuttle buggy; Skiploader operator (crawler and wheel type over 1-1/2 yds. up to and including 6-1/2 yds.); Soil remediation plant operator; Surface heaters and planer operator; Tractor compressor drill combination operator; Tractor operator (any type larger than D-5 - 100 flywheel h.p. and over, or similar-bulldozer, tamper, scraper and push tractor single engine); Tractor operator (boom attachments), Traveling pipe wrapping, cleaning and bendng machine operator; Trenching machine operator (over 6 ft. depth capacity, manufacturer's rating); trenching Machine with Road Miner

attachment (over 6 ft depth capacity): Ultra high pressure waterjet cutting tool system mechanic; Water pull (compaction) operator

GROUP 9: Heavy Duty Repairman

GROUP 10: Drilling machine operator, Bucket or auger types (Calweld 200 B bucket or similar types-Watson 3000 or 5000 auger or similar types-Texoma 900 auger or similar types-drilling depth of 105' maximum); Dual drum mixer, dynamic compactor LDC350 (or similar types); Monorail locomotive operator (diesel, gas or electric); Motor patrol-blade operator (single engine); Multiple engine tractor operator (Euclid and similar type-except Quad 9 cat.); Rubber-tired earth-moving equipment operator (single engine, over 50 yds. struck); Pneumatic pipe ramming tool and similar types; Prestressed wrapping machine operator; Rubber-tired earth-moving equipment operator (single engine, over 50 yds. struck); Rubber tired earth moving equipment operator (multiple engine, Euclid, caterpillar and similar over 25 yds. and up to 50 yds. struck), Tower crane repairman; Tractor loader operator (crawler and wheel type over 6-1/2 yds.); Woods mixer operator (and similar Pugmill equipment)

GROUP 11: Heavy Duty Repairman - Welder Combination, Welder - Certified.

GROUP 12: Auto grader operator; Automatic slip form operator; Drilling machine operator, bucket or auger types (Calweld, auger 200 CA or similar types - Watson, auger 6000 or similar types - Hughes Super Duty, auger 200 or similar types - drilling depth of 175' maximum); Hoe ram or similar with compressor; Mass excavator operator less tha 750 cu. yards; Mechanical finishing machine operator; Mobile form traveler operator; Motor patrol operator (multi-engine); Pipe mobile machine operator; Rubber-tired earth- moving equipment operator (multiple engine, Euclid, Caterpillar and similar type, over 50 cu. yds. struck); Rubber-tired self- loading scraper operator (paddle-wheel-auger type self-loading - two (2) or more units)

GROUP 13: Rubber-tired earth-moving equipment operator operating equipment with push-pull system (single engine, up to and including 25 yds. struck)

GROUP 14: Canal liner operator; Canal trimmer operator; Remote- control earth-moving equipment operator (operating a second piece of equipment: $1.00 per hour additional); Wheel excavator operator (over 750 cu. yds.)

GROUP 15: Rubber-tired earth-moving equipment operator, operating equipment with push-pull system (single engine, Caterpillar, Euclid, Athey Wagon and similar types with any and all attachments over 25 yds. and up to and including 50 yds. struck); Rubber-tired earth-moving equipment operator, operating equipment with push-pull system (multiple

engine-up to and including 25 yds. struck)

GROUP 16: Rubber-tired earth-moving equipment operator, operating equipment with push-pull system (single engine, over 50 yds. struck); Rubber-tired earth-moving equipment operator, operating equipment with push-pull system (multiple engine, Euclid, Caterpillar and similar, over 25 yds. and up to 50 yds. struck)

GROUP 17: Rubber-tired earth-moving equipment operator, operating equipment with push-pull system (multiple engine, Euclid, Caterpillar and similar, over 50 cu. yds. struck); Tandem tractor operator (operating crawler type tractors in tandem - Quad 9 and similar type)

GROUP 18: Rubber-tired earth-moving equipment operator, operating in tandem (scrapers, belly dumps and similar types in any combination, excluding compaction units - single engine, up to and including 25 yds. struck)

GROUP 19: Rotex concrete belt operator (or similar types); Rubber-tired earth-moving equipment operator, operating in tandem (scrapers, belly dumps and similar types in any combination, excluding compaction units - single engine, Caterpillar, Euclid, Athey Wagon and similar types with any and all attachments over 25 yds.and up to and including 50 cu. yds. struck); Rubber-tired earth-moving equipment operator, operating in tandem (scrapers, belly dumps and similar types in any combination, excluding compaction units - multiple engine, up to and including 25 yds. struck)

GROUP 20: Rubber-tired earth-moving equipment operator, operating in tandem (scrapers, belly dumps and similar types in any combination, excluding compaction units - single engine, over 50 yds. struck); Rubber-tired earth-moving equipment operator, operating in tandem (scrapers, belly dumps, and similar types in any combination, excluding compaction units - multiple engine, Euclid, Caterpillar and similar, over 25 yds. and up to 50 yds. struck)

GROUP 21: Rubber-tired earth-moving equipment operator, operating in tandem (scrapers, belly dumps and similar types in any combination, excluding compaction units - multiple engine, Euclid, Caterpillar and similar type, over 50 cu. yds. struck)

GROUP 22: Rubber-tired earth-moving equipment operator, operating equipment with the tandem push-pull system (single engine, up to and including 25 yds. struck)

GROUP 23: Rubber-tired earth-moving equipment operator, operating equipment with the tandem push-pull system (single engine, Caterpillar, Euclid, Athey Wagon and similar types with any and all attachments over 25 yds. and up to and including 50 yds. struck); Rubber-tired earth-moving equipment operator, operating with the tandem

push-pull system (multiple engine, up to and including 25 yds. struck)

GROUP 24: Rubber-tired earth-moving equipment operator, operating equipment with the tandem push-pull system (single engine, over 50 yds. struck); Rubber-tired earth-moving equipment operator, operating equipment with the tandem push-pull system (multiple engine, Euclid, Caterpillar and similar, over 25 yds. and up to 50 yds. struck)

GROUP 25: Concrete pump operator-truck mounted; Rubber-tired earth-moving equipment operator, operating equipment with the tandem push-pull system (multiple engine, Euclid, Caterpillar and similar type, over 50 cu. yds. struck)

CRANES, PILEDRIVING AND HOISTING EQUIPMENT CLASSIFICATIONS

GROUP 1: Engineer oiler; Fork lift operator (includes loed, lull or similar types)

GROUP 2: Truck crane oiler

GROUP 3: A-frame or winch truck operator; Ross carrier operator (jobsite)

GROUP 4: Bridge-type unloader and turntable operator; Helicopter hoist operator

GROUP 5: Hydraulic boom truck; Stinger crane (Austin-Western or similar type); Tugger hoist operator (1 drum)

GROUP 6: Bridge crane operator; Cretor crane operator; Hoist operator (Chicago boom and similar type); Lift mobile operator; Lift slab machine operator (Vagtborg and similar types); Material hoist and/or manlift operator; Polar gantry crane operator; Self Climbing scaffold (or similar type); Shovel, backhoe, dragline, clamshell operator (over 3/4 yd. and up to 5 cu. yds. mrc); Tugger hoist operator

GROUP 7: Pedestal crane operator; Shovel, backhoe, dragline, clamshell operator (over 5 cu. yds. mrc); Tower crane repair; Tugger hoist operator (3 drum)

GROUP 8: Crane operator (up to and including 25 ton capacity); Crawler transporter operator; Derrick barge operator (up to and including 25 ton capacity); Hoist operator, stiff legs, Guy derrick or similar type (up to and including 25 ton capacity); Shovel, backhoe, dragline, clamshell operator (over 7 cu. yds., M.R.C.)

GROUP 9: Crane operator (over 25 tons and up to and including 50 tons mrc); Derrick barge operator (over 25 tons up to and including 50 tons mrc); Highline cableway operator; Hoist operator, stiff legs, Guy derrick or similar type (over 25 tons up to and including 50 tons mrc); K-crane operator; Polar crane operator; Self erecting tower crane

operator maximum lifting capacity ten tons

GROUP 10: Crane operator (over 50 tons and up to and including 100 tons mrc); Derrick barge operator (over 50 tons up to and including 100 tons mrc); Hoist operator, stiff legs, Guy derrick or similar type (over 50 tons up to and including 100 tons mrc), Mobile tower crane operator (over 50 tons, up to and including 100 tons M.R.C.); Tower crane operator and tower gantry

GROUP 11: Crane operator (over 100 tons and up to and including 200 tons mrc); Derrick barge operator (over 100 tons up to and including 200 tons mrc); Hoist operator, stiff legs, Guy derrick or similar type (over 100 tons up to and including 200 tons mrc); Mobile tower crane operator (over 100 tons up to and including 200 tons mrc)

GROUP 12: Crane operator (over 200 tons up to and including 300 tons mrc); Derrick barge operator (over 200 tons up to and including 300 tons mrc); Hoist operator, stiff legs, Guy derrick or similar type (over 200 tons, up to and including 300 tons mrc); Mobile tower crane operator (over 200 tons, up to and including 300 tons mrc)

GROUP 13: Crane operator (over 300 tons); Derrick barge operator (over 300 tons); Helicopter pilot; Hoist operator, stiff legs, Guy derrick or similar type (over 300 tons); Mobile tower crane operator (over 300 tons)

TUNNEL CLASSIFICATIONS

GROUP 1: Skiploader (wheel type up to 3/4 yd. without attachment)

GROUP 2: Power-driven jumbo form setter operator

GROUP 3: Dinkey locomotive or motorperson (up to and including 10 tons)

GROUP 4: Bit sharpener; Equipment greaser (grease truck); Slip form pump operator (power-driven hydraulic lifting device for concrete forms); Tugger hoist operator (1 drum); Tunnel locomotive operator (over 10 and up to and including 30 tons)

GROUP 5: Backhoe operator (up to and including 3/4 yd.); Small Ford, Case or similar; Drill doctor; Grouting machine operator; Heading shield operator; Heavy-duty repairperson; Loader operator (Athey, Euclid, Sierra and similar types); Mucking machine operator (1/4 yd., rubber-tired, rail or track type); Pneumatic concrete placing machine operator (Hackley-Presswell or similar type); Pneumatic heading shield (tunnel); Pumpcrete gun operator; Tractor compressor drill combination operator; Tugger hoist operator (2 drum); Tunnel locomotive operator (over 30 tons)

GROUP 6: Heavy Duty Repairman

GROUP 7: Tunnel mole boring machine operator

ENGINEERS ZONES

$1.00 additional per hour for all of IMPERIAL County and the portions of KERN, RIVERSIDE & SAN BERNARDINO Counties as defined below:

That area within the following Boundary: Begin in San Bernardino County, approximately 3 miles NE of the intersection of I-15 and the California State line at that point which is the NW corner of Section 1, T17N,m R14E, San Bernardino Meridian. Continue W in a straight line to that point which is the SW corner of the northwest quarter of Section 6, T27S, R42E, Mt. Diablo Meridian. Continue North to the intersection with the Inyo County Boundary at that point which is the NE corner of the western half of the northern quarter of Section 6, T25S, R42E, MDM. Continue W along the Inyo and San Bernardino County boundary until the intersection with Kern County, as that point which is the SE corner of Section 34, T24S, R40E, MDM. Continue W along the Inyo and Kern County boundary until the intersection with Tulare County, at that point which is the SW corner of the SE quarter of Section 32, T24S, R37E, MDM. Continue W along the Kern and Tulare County boundary, until that point which is the NW corner of T25S, R32E, MDM. Continue S following R32E lines to the NW corner of T31S, R32E, MDM. Continue W to the NW corner of T31S, R31E, MDM. Continue S to the SW corner of T32S, R31E, MDM. Continue W to SW corner of SE quarter of Section 34, T32S, R30E, MDM. Continue S to SW corner of T11N, R17W, SBM. Continue E along south boundary of T11N, SBM to SW corner of T11N, R7W, SBM. Continue S to SW corner of T9N, R7W, SBM. Continue E along south boundary of T9N, SBM to SW corner of T9N, R1E, SBM. Continue S along west boundary of R1E, SMB to Riverside County line at the SW corner of T1S, R1E, SBM. Continue E along south boundary of T1s, SBM (Riverside County Line) to SW corner of T1S, R10E, SBM. Continue S along west boundary of R10E, SBM to Imperial County line at the SW corner of T8S, R10E, SBM. Continue W along Imperial and Riverside county line to NW corner of T9S, R9E, SBM. Continue S along the boundary between Imperial and San Diego Counties, along the west edge of R9E, SBM to the south boundary of Imperial County/California state line. Follow the California state line west to Arizona state line, then north to Nevada state line, then continuing NW back to start at the point which is the NW corner of Section 1, T17N, R14E, SBM

$1.00 additional per hour for portions of SAN LUIS OBISPO, KERN, SANTA BARBARA & VENTURA as defined below:

That area within the following Boundary: Begin approximately 5 miles north of the community of Cholame, on the Monterey County and San Luis Obispo County boundary at the NW corner of T25S, R16E, Mt. Diablo Meridian. Continue south along the west side of R16E to the SW corner of T30S, R16E, MDM. Continue E to SW corner of T30S, R17E, MDM. Continue S to SW corner of T31S,

R17E, MDM. Continue E to SW corner of T31S, R18E, MDM. Continue S along West side of R18E, MDM as it crosses into San Bernardino Meridian numbering area and becomes R30W. Follow the west side of R30W, SBM to the SW corner of T9N, R30W, SBM. Continue E along the south edge of T9N, SBM to the Santa Barbara County and Ventura County boundary at that point whch is the SW corner of Section 34.T9N, R24W, SBM, continue S along the Ventura County line to that point which is the SW corner of the SE quarter of Section 32, T7N, R24W, SBM. Continue E along the south edge of T7N, SBM to the SE corner to T7N, R21W, SBM. Continue N along East side of R21W, SBM to Ventura County and Kern County boundary at the NE corner of T8N, R21W. Continue W along the Ventura County and Kern County boundary to the SE corner of T9N, R21W. Continue North along the East edge of R21W, SBM to the NE corner of T12N, R21W, SBM. Continue West along the north edge of T12N, SBM to the SE corner of T32S, R21E, MDM. [T12N SBM is a think strip between T11N SBM and T32S MDM]. Continue North along the East side of R21E, MDM to the Kings County and Kern County border at the NE corner of T25S, R21E, MDM, continue West along the Kings County and Kern County Boundary until the intersection of San Luis Obispo County. Continue west along the Kings County and San Luis Obispo County boundary until the intersection with Monterey County. Continue West along the Monterey County and San Luis Obispo County boundary to the beginning point at the NW corner of T25S, R16E, MDM.

$2.00 additional per hour for INYO and MONO Counties and the Northern portion of SAN BERNARDINO County as defined below:

That area within the following Boundary: Begin at the intersection of the northern boundary of Mono County and the California state line at the point which is the center of Section 17, T10N, R22E, Mt. Diablo Meridian. Continue S then SE along the entire western boundary of Mono County, until it reaches Inyo County at the point which is the NE corner of the Western half of the NW quarter of Section 2, T8S, R29E, MDM. Continue SSE along the entire western boundary of Inyo County, until the intersection with Kern County at the point which is the SW corner of the SE 1/4 of Section 32, T24S, R37E, MDM. Continue E along the Inyo and Kern County boundary until the intersection with San Bernardino County at that point which is the SE corner of section 34, T24S, R40E, MDM. Continue E along the Inyo and San Bernardino County boundary until the point which is the NE corner of the Western half of the NW quarter of Section 6, T25S, R42E, MDM. Continue S to that point which is the SW corner of the NW quarter of Section 6, T27S, R42E, MDM. Continue E in a straight line to the California and Nevada state border at the point which is the NW corner of Section 1, T17N, R14E, San Bernardino Meridian. Then continue NW along the state line to the starting point, which is the center of Section 18, T10N, R22E, MDM.

REMAINING AREA NOT DEFINED ABOVE RECIEVES BASE RATE

ENGI0012-004 08/01/2015

	Rates	Fringes
OPERATOR: Power Equipment (DREDGING)		
(1) Leverman	$ 49.50	23.60
(2) Dredge dozer	$ 43.53	23.60
(3) Deckmate	$ 43.42	23.60
(4) Winch operator (stern winch on dredge)	$ 42.87	23.60
(5) Fireman-Oiler, Deckhand, Bargeman, Leveehand	$ 42.33	23.60
(6) Barge Mate	$ 42.94	23.60

IRON0377-002 07/01/2016

	Rates	Fringes
Ironworkers:		
Fence Erector	$ 28.33	20.64
Ornamental, Reinforcing and Structural	$ 34.75	29.20

PREMIUM PAY:

$6.00 additional per hour at the following locations:

China Lake Naval Test Station, Chocolate Mountains Naval Reserve-Niland,
Edwards AFB, Fort Irwin Military Station, Fort Irwin Training Center-Goldstone, San Clemente Island, San Nicholas Island, Susanville Federal Prison, 29 Palms - Marine Corps, U.S. Marine Base - Barstow, U.S. Naval Air Facility - Sealey, Vandenberg AFB

$4.00 additional per hour at the following locations:

Army Defense Language Institute - Monterey, Fallon Air Base, Naval Post Graduate School - Monterey, Yermo Marine Corps Logistics Center

$2.00 additional per hour at the following locations:

Port Hueneme, Port Mugu, U.S. Coast Guard Station - Two Rock

LABO0089-001 07/18/2016

	Rates	Fringes
LABORER (BUILDING and all other Residential Construction)		
Group 1	$ 29.42	19.78

Group 2	$ 30.10	19.78
Group 3	$ 30.81	19.78
Group 4	$ 31.61	19.78
Group 5	$ 33.54	19.78
LABORER (RESIDENTIAL CONSTRUCTION - See definition below)		
(1) Laborer	$ 27.32	18.11
(2) Cleanup, Landscape, Fencing (Chain Link & Wood)	$ 26.03	18.11

RESIDENTIAL DEFINITION: Wood or metal frame construction of single family residences, apartments and condominums - excluding (a) projects that exceed three stories over a garage level, (b) any utility work such as telephone, gas, water, sewer and other utilities and (c) any fine grading work, utility work or paving work in the future street and public right-of-way; but including all rough grading work at the job site behind the existing right of way

LABORER CLASSIFICATIONS

GROUP 1: Cleaning and handling of panel forms; Concrete Screeding for Rought Strike-off; Concrete, water curing; Demolition laborer; Flagman; Gas, oil and/or water pipeline laborer; General Laborer; General clean-up laborer; Landscape laborer; Jetting laborer; Temporary water and air lines laborer; Material hoseman (walls, slabs, floors and decks); Plugging, filling of Shee-bolt holes; Dry packing of concrete; Railroad maintenance, Repair Trackman and road beds, Streetcar and railroad construction trac laborers; Slip form raisers; Slurry seal crews (mixer operator, applicator operator, squeegee man, Shuttle man, top man), filling of cracks by any method on any surface; Tarman and mortar man; Tool crib or tool house laborer; Window cleaner; Wire Mesh puling-all concrete pouring operations

GROUP 2: Asphalt Shoveler; Cement Dumper (on 1 yard or larger mixer and handling bulk cement); Cesspool digger and installer; Chucktender; Chute man, pouring concrete, the handling of the cute from ready mix trucks, such as walls, slabs, decks, floors, foundations, footings, curbs, gutters and sidewalks; Concrete curer-impervious membrane and form oiler; Cutting torch operator (demoliton); Guinea chaser; Headboard man-asphlt; Laborer, packing rod steel and pans; membrane vapor barrier installer; Power broom sweepers (small); Riiprap, stonepaver, placing stone or wet sacked concrete; Roto scraper and tiller; Tank sealer and cleaner; Tree climber, faller, chain saw operator, Pittsburgh Chipper and similar type brush shredders; Underground laborers, including caisson bellower

GROUP 3: Buggymobile; Concrete cutting torch; Concrete cutting torch; Concrete pile cutter; Driller, jackhammer, 2 1/2 feet drill steel or longer; Dri Pak-it machine; High sealer (including drilling of same); Hydro seeder and

similar type; Impact wrench, mult-plate; Kettlemen, potmen and mean applying asphalt, lay-kold, creosote, line caustic and similar type materials (applying means applying, dipping, brushing or handling of such materials for pipe wrapping and waterproofing); Operators of pneumatic, gas, electric tools, vibratring machines, pavement breakers, air blasting, come-along, and similar mechanical tools not separately classified herein; Pipelayers back up man coating, grouting, making of joints, sealing, caulking, diapering and inclduing rubber gasket joints, pointing and any and all other services; Rotary Scarifier or multiple head concrete chipping scaarifier; Steel header board man and guideline setter; Tampers, Barko, Wacker and similar type; Trenching machine, handpropelled

GROUP 4: Asphalt raker, luterman, ironer, apshalt dumpman and asphalt spreader boxes (all types); Concrete core cutter (walls, floors or ceilings), Grinder or sander; Concrete saw man; cutting walls or flat work, scoring old or new concrete; Cribber, shorer, lagging, sheeting and trench bracing, hand-guided lagging hammer; Laser beam in connection with laborer's work; Oversize concrete vibrator operator 70 pounds and over; Pipelayer performing all services in the laying, installation and all forms of connection of pipe from the point of receiving pipe in the ditch until completion of oepration, including any and all forms of tubular material, whether pipe, metallic or non-metallic, conduit, and any other stationary type of tubular device used for the conveying of any substance or element, whether water, sewage, solid, gas, air or other product whatsoever and without regard to the nature of material from which the tubular material is fabricated; No joint pipe and stripping of same; Prefabricated manhole installer; Sandblaster (nozzleman), Porta shot-blast, water blasting

GROUP 5: Blasters Powderman-All work of loading holes, placing and blasting of all pwder and explosives of whatever type, regardless of method used for such loading and placing; Driller-all power drills, excluding jackhammer, whether core, diamond, wagon, track, multiple unit, and any and all other types of mechanical drills without regard to the form of motive power.

LAB00089-002 11/01/2016

	Rates	Fringes
LABORER (MASON TENDER).....	$ 29.62	15.89

LAB00089-004 07/03/2016

HEAVY AND HIGHWAY CONSTRUCTION

	Rates	Fringes

Laborers:

Group 1	$ 30.54	17.89
Group 2	$ 31.00	17.89
Group 3	$ 31.41	17.89
Group 4	$ 32.25	17.89
Group 5	$ 36.37	17.89

LABORER CLASSIFICATIONS

GROUP 1: Laborer: General or Construction Laborer, Landscape Laborer. Asphalt Rubber Material Loader. Boring Machine Tender (outside), Carpenter Laborer (cleaning, handling, oiling & blowing of panel forms and lumber), Concrete Laborer, Concrete Screeding for rough strike-off, Concrete water curing. Concrete Curb & Gutter laborer, Certified Confined Space Laborer, Demolition laborer & Cleaning of Brick and lumber,Expansion Joint Caulking; Environmental Remediation, Monitoring Well, Toxic waste and Geotechnical Drill tender, Fine Grader, Fire Watcher, Limbers, Brush Loader, Pilers and Debris Handlers. flagman. Gas Oil and Water Pipeline Laborer. Material Hoseman (slabs, walls, floors, decks); Plugging, filling of shee bolt holes; Dry packing of concrete and patching; Post Holer Digger (manual); Railroad maintenance, repair trackman, road beds; Rigging & signaling; Scaler, Slip-Form Raisers, Filling cracks on any surface, tool Crib or Tool House Laborer, Traffic control (signs, barriers, barricades, delineator, cones etc.), Window Cleaner

GROUP 2: Asphalt abatement; Buggymobile; Cement dumper (on 1 yd. or larger mixers and handling bulk cement); Concrete curer, impervious membrane and form oiler; Chute man, pouring concrete; Concrete cutting torch; Concrete pile cutter; driller/Jackhammer, with drill steel 2 1/'2 feet or longer; Dry pak-it machine; Fence erector; Pipeline wrapper, gas, oil, water, pot tender & form man; Grout man; Installation of all asphalt overlay fabric and materials used for reinforcing asphalt; Irrigation laborer; Kettleman-Potman hot mop, includes applying asphalt, lay-klold, creosote, lime caustic and similar tyhpes of materials (dipping, brushing, handling) and waterproofing; Membrane vapor barrier installer; Pipelayer backup man (coating, grouting, making of joints, sealing caulkiing, diapering including rubber basket joints, pointing); Rotary scarifier, multiple head concrete chipper; Rock slinger; Roto scraper & tiller; Sandblaster pot tender; Septic tank digger/installer; Tamper/wacker operator; Tank scaler & cleaner; Tar man & mortar man; Tree climber/faller, chainb saw operator, Pittsburgh chipper & similar type brush shredders.

GROUP 3: Asphalt, installation of all frabrics; Buggy Mobile Man, Bushing hammer; Compactor (all types), Concrete Curer - Impervious membrane, Form Oiler, Concrete Cutting Torch, Concrete Pile Cutter,Driller/Jackhammer with drill steel 2 1/2 ft or longer, Dry Pak-it machine, Fence erector including manual post hole digging, Gas oil or water

Pipeline Wrapper - 6 ft pipe and over, Guradrail erector, Hydro seeder, Impact Wrench man (multi plate), kettleman-Potman Hot Mop includes applying Asphalt, Lay-Kold, Creosote, lime caustic and similar types of materials (dipping, brushing or handling) and waterproofing. Laser Beam in connection with Laborer work. High Scaler, Operators of Pneumatic Gas or Electric Tools, Vibrating Machines, Pavement Breakers, Air Blasting, Come-Alongs and similar mechanical tools, Remote-Controlled Robotic Tools in connection with Laborers work. Pipelayer Backup Man (Coating, grouting,m makeing of joints, sealing, caulking, diapering including rubber gasket joints, pointing and other services). Power Post Hole Digger, Rotary Scarifier (multiple head concrete chipper scarifier), Rock Slinger, Shot Blast equipment (8 to 48 inches), Steel Headerboard Man and Guideline Setter, Tamper/Wacker operator and similar types, Trenching Machine hand propelled.

GROUP 4: Any worker exposed to raw sewage. Asphalt Raker, Luteman, Asphalt Dumpman, Asphalt Spreader Boxes, Concrete Core Cutter, Concrete Saw Man, Cribber, Shorer, Head Rock Slinger. Installation of subsurface instrumentation, monitoring wells or points, remediation system installer; Laborer, asphalt-rubber distributor bootman; Oversize concrete vibrator operators, 70 pounds or over. Pipelayer, Prfefabricated Manhole Installer, Sandblast Nozzleman (Water Balsting-Porta Shot Blast), Traffic Lane Closure.

GROUP 5: Blasters Powderman-All work of loading holes, placing and blasting of all powder and explosives of whatever type, regardless of method used for such loading and placing; Horizontal directional driller, Boring system, Electronic traking, Driller: all power drills excluding jackhammer, whether core, diamond, wagon, track, multiple unit, and all other types of mechanical drills without regard to form of motive power. Environmental remediation, Monitoring well, Toxic waste and Geotechnical driller, Toxic waste removal. Welding in connection with Laborer's work.

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* LABO0300-005 01/01/2017

	Rates	Fringes
Asbestos Removal Laborer.....	$ 31.88	16.82

SCOPE OF WORK: Includes site mobilization, initial site cleanup, site preparation, removal of asbestos-containing material and toxic waste, encapsulation, enclosure and disposal of asbestos- containing materials and toxic waste by hand or with equipment or machinery; scaffolding, fabrication of temporary wooden barriers and assembly of decontamination stations.

LABO1184-001 07/04/2016

	Rates	Fringes
Laborers: (HORIZONTAL DIRECTIONAL DRILLING)		
(1) Drilling Crew Laborer...	$ 33.65	13.95
(2) Vehicle Operator/Hauler.	$ 33.82	13.95
(3) Horizontal Directional Drill Operator.....	$ 35.67	13.95
(4) Electronic Tracking Locator.....	$ 37.67	13.95
Laborers: (STRIPING/SLURRY SEAL)		
GROUP 1.....	$ 34.86	17.03
GROUP 2.....	$ 36.16	17.03
GROUP 3.....	$ 38.17	17.03
GROUP 4.....	$ 39.91	17.03

LABORERS - STRIPING CLASSIFICATIONS

GROUP 1: Protective coating, pavement sealing, including repair and filling of cracks by any method on any surface in parking lots, game courts and playgrounds; carstops; operation of all related machinery and equipment; equipment repair technician

GROUP 2: Traffic surface abrasive blaster; pot tender - removal of all traffic lines and markings by any method (sandblasting, waterblasting, grinding, etc.) and preparation of surface for coatings. Traffic control person: controlling and directing traffic through both conventional and moving lane closures; operation of all related machinery and equipment

GROUP 3: Traffic delineating device applicator: Layout and application of pavement markers, delineating signs, rumble and traffic bars, adhesives, guide markers, other traffic delineating devices including traffic control. This category includes all traffic related surface preparation (sandblasting, waterblasting, grinding) as part of the application process. Traffic protective delineating system installer: removes, relocates, installs, permanently affixed roadside and parking delineation barricades, fencing, cable anchor, guard rail, reference signs, monument markers; operation of all related machinery and equipment; power broom sweeper

GROUP 4: Striper: layout and application of traffic stripes and markings; hot thermo plastic; tape traffic stripes and markings, including traffic control; operation of all related machinery and equipment

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LABO1414-003 08/03/2016

	Rates	Fringes

LABORER
PLASTER CLEAN-UP LABORER....$ 31.60 19.28
PLASTER TENDER.....$ 34.15 19.28

Work on a swing stage scaffold: $1.00 per hour additional.

Work at Military Bases - $3.00 additional per hour:
Coronado Naval Amphibious Base, Fort Irwin, Marine Corps Air Station-29 Palms, Imperial Beach Naval Air Station, Marine Corps Logistics Supply Base, Marine Corps Pickle Meadows, Mountain Warfare Training Center, Naval Air Facility-Seeley, North Island Naval Air Station, Vandenberg AFB.

PAIN0036-001 07/01/2015

	Rates	Fringes
Painters: (Including Lead Abatement)		
(1) Repaint (excludes San Diego County)	$ 27.29	12.83
(2) All Other Work	$ 30.72	12.83

REPAINT of any previously painted structure. Exceptions: work involving the aerospace industry, breweries, commercial recreational facilities, hotels which operate commercial establishments as part of hotel service, and sports facilities.

PAIN0036-010 10/01/2015

	Rates	Fringes
DRYWALL FINISHER/TAPER		
(1) Building & Heavy Construction	$ 27.84	15.20
(2) Residential Construction (Wood frame apartments, single family homes and multi-duplexes up to and including four stories)	$ 21.00	13.91

PAIN0036-012 10/01/2016

	Rates	Fringes
GLAZIER	$ 41.55	11.93

PAIN0036-019 01/01/2016

	Rates	Fringes

SOFT FLOOR LAYER.....$ 26.77 13.53

PLAS0200-005 08/06/2015

	Rates	Fringes
PLASTERER.....	$ 38.44	13.77

NORTH ISLAND NAVAL AIR STATION, COLORADO NAVAL AMPHIBIOUS BASE, IMPERIAL BEACH NAVAL AIR STATION: $3.00 additional per hour.

PLAS0500-001 07/01/2016

	Rates	Fringes
CEMENT MASON/CONCRETE FINISHER		
GROUP 1.....	$ 23.84	21.17
GROUP 2.....	$ 25.49	21.17
GROUP 3.....	$ 27.57	21.17

CEMENT MASONS - work inside the building line, meeting the following criteria:

GROUP 1: Residential wood frame project of any size; work classified as Type III, IV or Type V construction; interior tenant improvement work regardless the size of the project; any wood frame project of four stories or less.

GROUP 2: Work classified as type I and II construction

GROUP 3: All other work

PLUM0016-006 07/01/2016

	Rates	Fringes
PLUMBER, PIPEFITTER, STEAMFITTER		
Camp Pendleton.....	$ 51.69	21.41
Plumber and Pipefitter All other work except work on new additions and remodeling of bars, restaurant, stores and commercial buildings not to exceed 5,000 sq. ft. of floor space and work on strip malls, light commercial, tenant improvement and remodel work.....	$ 47.19	21.41
Work ONLY on new additions and remodeling of commercial buildings,		

bars, restaurants, and
stores not to exceed 5,000
sq. ft. of floor space.....$ 45.73 20.43
Work ONLY on strip malls,
light commercial, tenant
improvement and remodel
work.....$ 35.69 18.76

PLUM0016-011 07/01/2016

	Rates	Fringes
PLUMBER/PIPEFITTER		
Residential	$ 38.17	17.33

PLUM0345-001 07/01/2014

	Rates	Fringes
PLUMBER		
Landscape/Irrigation Fitter	$ 29.27	19.75
Sewer & Storm Drain Work	$ 33.24	17.13

ROOF0045-001 07/01/2012

	Rates	Fringes
ROOFER	$ 25.08	7.28

SFCA0669-001 04/01/2016

	Rates	Fringes
SPRINKLER FITTER	$ 37.67	19.56

SHEE0206-001 07/01/2015

	Rates	Fringes
SHEET METAL WORKER		
Camp Pendleton	$ 37.55	23.23
Except Camp Pendleton	$ 35.33	23.23
Sheet Metal Technician	$ 25.22	6.69

SHEET METAL TECHNICIAN - SCOPE:
a. Existing residential buildings, both single and multi-family, where each unit is heated and/or cooled by a separate system b. New single family residential buildings including tracts. c. New multi-family residential buildings, not exceeding five stories of living space in height, provided each unit is heated or cooled by a separate system. Hotels and motels are excluded. d. LIGHT COMMERCIAL WORK: Any sheet metal, heating and air conditioning work performed on a project where the total construction cost, excluding land, is under $1,000,000 e. TENANT IMPROVEMENT WORK: Any work necessary to finish interior spaces to conform to the occupants of commercial buildings, after completion of the building shell

TEAM0036-001 07/04/2016

	Rates	Fringes
Truck drivers:		
GROUP 1	$ 15.90	30.69
GROUP 2	$ 23.49	30.69
GROUP 3	$ 23.69	30.69
GROUP 4	$ 23.89	30.69
GROUP 5	$ 24.09	30.69
GROUP 6	$ 24.59	30.69
GROUP 7	$ 26.09	30.69

FOOTNOTE: HAZMAT PAY: Work on a hazmat job, where hazmat certification is required, shall be paid, in addition to the classification working in, as follows: Levels A, B and C - +$1.00 per hour. Workers shall be paid hazmat pay in increments of four (4) and eight (8) hours.

TRUCK DRIVER CLASSIFICATIONS

GROUP 1: Fuel Man, Swamper

GROUP 2: 2-axle Dump Truck, 2-axle Flat Bed,Concrete Pumping Truck, Industrial Lift Truck, Motorized Traffic Control, Pickup Truck on Jobsite

GROUP 3: 2-axle Water Truck, 3-axle Dump Truck, 3-axle Flat Bed, Erosion Control Nozzleman, Dump Crete Truck under 6.5 yd, Forklift 15,000 lbs and over, Prell Truck, Pipeline Work Truck Driver, Road Oil Spreader, Cement Distributor or Slurry Driver, Bootman, Ross Carrier

GROUP 4: Off-road Dump Truck under 35 tons 4-axles but less than 7-axles, Low-Bed Truck & Trailer, Transit Mix Trucks under 8 yd, 3-axle Water Truck, Erosion Control Driver, Grout Mixer Truck, Dump Crete 6.5yd and over, Dumpster Trucks, DW 10, DW 20 and over, Fuel Truck and Dynamite, Truck Greaser, Truck Mounted Mobile Sweeper 2-axle Winch Truck

GROUP 5: Off-road Dump Truck 35 tons and over, 7-axles or more, Transit Mix Trucks 8 yd and over, A-Frame Truck, Swedish Cranes

GROUP 6: Off-Road Special Equipment (including but not limited to Water Pull Tankers, Athey Wagons, DJB, B70 Wuclids or like Equipment)

GROUP 7: Repairman

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

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Note: Executive Order (EO) 13706, Establishing Paid Sick Leave for Federal Contractors applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2017. If this contract is covered by the EO, the contractor must provide employees with 1 hour of paid sick leave for every 30 hours they work, up to 56 hours of paid sick leave each year. Employees must be permitted to use paid sick leave for their own illness, injury or other health-related needs, including preventive care; to assist a family member (or person who is like family to the employee) who is ill, injured, or has other health-related needs, including preventive care; or for reasons resulting from, or to assist a family member (or person who is like family to the employee) who is a victim of, domestic violence, sexual assault, or stalking. Additional information on contractor requirements and worker protections under the EO is available at www.dol.gov/whd/govcontracts.

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (ii)).

The body of each wage determination lists the classification and wage rates that have been found to be prevailing for the cited type(s) of construction in the area covered by the wage determination. The classifications are listed in alphabetical order of "identifiers" that indicate whether the particular rate is a union rate (current union negotiated rate for local), a survey rate (weighted average rate) or a union average rate (weighted union average rate).

Union Rate Identifiers

A four letter classification abbreviation identifier enclosed in dotted lines beginning with characters other than "SU" or "UAVG" denotes that the union classification and rate were prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2014. PLUM is an abbreviation identifier of the union which prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. 07/01/2014 is the effective date of the most current negotiated rate, which in this example is July 1, 2014.

Union prevailing wage rates are updated to reflect all rate changes in the collective bargaining agreement (CBA) governing this classification and rate.

Survey Rate Identifiers

Classifications listed under the "SU" identifier indicate that no one rate prevailed for this classification in the survey and the published rate is derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As this weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SULA2012-007 5/13/2014. SU indicates the rates are survey rates based on a weighted average calculation of rates and are not majority rates. LA indicates the State of Louisiana. 2012 is the year of survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. 5/13/2014 indicates the survey completion date for the classifications and rates under that identifier.

Survey wage rates are not updated and remain in effect until a new survey is conducted.

Union Average Rate Identifiers

Classification(s) listed under the UAVG identifier indicate that no single majority rate prevailed for those classifications; however, 100% of the data reported for the classifications was union data. EXAMPLE: UAVG-OH-0010 08/29/2014. UAVG indicates that the rate is a weighted union average rate. OH indicates the state. The next number, 0010 in the example, is an internal number used in producing the wage determination. 08/29/2014 indicates the survey completion date for the classifications and rates under that identifier.

A UAVG rate will be updated once a year, usually in January of each year, to reflect a weighted average of the current negotiated/CBA rate of the union locals from which the rate is based.

WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can be:

* an existing published wage determination
* a survey underlying a wage determination
* a Wage and Hour Division letter setting forth a position on a wage determination matter
* a conformance (additional classification and rate) ruling

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour Regional Office for the area in which the survey was conducted

because those Regional Offices have responsibility for the Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:

Branch of Construction Wage Determinations
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

2.) If the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

Wage and Hour Administrator
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3.) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

4.) All decisions by the Administrative Review Board are final.

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END OF GENERAL DECISION

JOINT VENTURE AGREEMENT

This Joint Venture Agreement ("Agreement") is entered into in Poway, California by West Coast General Corporation, a California corporation, ("WEST COAST") and PK Mechanical Systems, Inc., a California corporation, ("PK Mechanical"). In this Agreement, WEST COAST and PK Mechanical are referred to collectively as the "Joint Venturers" and singularly as a "Joint Venturer."

RECITALS

A. WEST COAST and PK Mechanical currently engage in construction activities pursuant to licenses issued by the California Contractors State License Board.

B. WEST COAST and PK Mechanical desire to form a Joint Venture to submit a bid to construct a work of improvement known as Bid No.: K-17-1401-DBB-3, 69th & Mohawk Pump Station (the "Project"), and, if low bidder, enter into a general contract ("Contract") with City of San Diego (the "Owner") for performance of the Project.

C. WEST COAST and PK Mechanical desire that their interests in the services, profits, and liabilities under the Contract be defined by this Agreement.

TERMS AND CONDITIONS

1. Formation Of Joint Venture: WEST COAST and PK Mechanical constitute themselves as joint venturers for the purpose of bidding, performing and completing the Contract. This Agreement contemplates only the furnishing and performance of the work, labor, service, materials, plant, required warranties, equipment and supplies necessary for the completion of the Contract and the Project. The Joint Venturers are not making any permanent partnership agreement or joint venture agreement to bid for or undertake any act or commitment other than the Contract. Nothing in this Agreement shall be construed as a limitation of the powers or rights of either Joint Venturer to carry on its separate business for its sole benefit. The work to be performed by the Joint Venture is the Contract, and any change orders or supplemental agreements with the Owner in connection with the Project, all of which are referred to as the "Work" and will be performed by the Joint Venture operating under the name "West Coast General Corporation / PK Mechanical Systems, Inc., a Joint Venture" and California Contractor's License No. Pending (the "Joint Venture"). (NOTE: California Contractor's License to be acquired by West Coast General Corporation prior to award per statute.)

2. Administration: In order to facilitate the handling of all matters and questions in connection with the bidding and performance of the Contract, each Joint Venturer appoints the following representative to act for it in all matters relative to the Joint Venture:

   WEST COAST appoints David E. Davey.

   PK Mechanical appoints David R. Spindler

   Actions and decisions concerning the portion of the Work to be performed by PK Mechanical will be by unanimous vote. Each representative may delegate their powers as they deem

Initials: _____
WEST COAST (PK Mechanical)

necessary or convenient in the best interest of the Joint Venture. If necessary or desirable, each Joint Venturer will execute and deliver to its respective representative such powers of attorney as may be required to enable the representative to properly perform the duties entrusted to them. It is understood and agreed that neither PK Mechanical nor WEST COAST will have the power to borrow money for, in the name of, or to pledge the credit of the Joint Venture, the other Joint Venturer or on their joint credit.

In the event that either representative dies or becomes permanently incapacitated or unavailable to act, then a successor shall be named by the Joint Venturer who appointed such representative. Any successor will have every power to act that was possessed by his predecessor under this Agreement. Either Joint Venturer at any time may change its representative by advising the other of such appointment, but until the appointment and notification of the appointment to the other, each Joint Venturer will be bound by the acts and decisions of its representative.

Meetings of the representatives for the transaction of the business of the Joint Venture may be called by either Joint Venturer subject to reasonable notice.

WEST COAST will be the administrative manager for the Joint Venture and will process the bid, the Contract, and other documentation required to be submitted to the Owner. WEST COAST will serve in this capacity without cost to the Joint Venture and without cost to PK Mechanical. WEST COAST will make no agreements or commitments or sign orders for Change Orders or Daily Work Reports affecting the Work of PK Mechanical without PK Mechanical's permission. Each Joint Venturer will receive all of the proceeds of any cost reduction incentive associated with its respective scope of Work. PK Mechanical and WCGC will handle all payment applications to owner jointly. WCGC and PK Mechanical will hold a meeting the first Tuesday after the end of the month and prepare the billing. The billing will be submitted to City of San Diego no later than the 5th of every month. PK Mechanical will be copied on all emails to the City of San Diego regarding billing submission. If the agreed to invoice submission timeframe is not met by WCGC, PK Mechanical may take over submitting billing from that occurrence forward, until the end of the project. PK Mechanical will handle all of PK's change orders.

3. Preparation Of Bid: The Joint Venture bid shall be submitted in the name of "West Coast General Corporation / PK Mechanical Systems, Inc., a Joint Venture." The Joint Venture bid will not be submitted unless the Joint Venturers agree to the amount and all terms and provisions of the bid concerning their respective portion of the Work. Either Joint Venturer may at any time prior to the submission of the bid, withdraw from this Joint Venture by notifying the other Joint Venturer in writing. The withdrawal from this Joint Venture will terminate each Joint Venturer's obligations under this Agreement; provided, however, the withdrawing Joint Venturer will be precluded from bidding the Contract, but not the Project. After the bid has been submitted, no withdrawal or modification will be made unless consented to by both Joint Venturers. Each Joint Venturer will bear its own estimating and bidding expenses.

4. Scope And Division Of Work: PK Mechanical will perform the work required for the following line items set forth in the bid for the Project and pursuant to the following price schedule: See attached Exhibit "B".

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WEST COAST (PK Mechanical)

WEST COAST will perform the work required in Exhibit 'A' as set forth in the bid for the Project and pursuant to the following price schedule including Exhibit 'A'.

PK Mechanical has no other duties or obligations with respect to the Contract, the Project or the Work, except as set forth in this Agreement. All profits, losses, revenues and expenses with respect to such portion of the Work performed by PK Mechanical will be solely for the account of PK Mechanical. WEST COAST will perform all other Work and furnish all other material required by the Contract. All profits, losses, revenues and expenses with respect to such portion of the Work performed by WEST COAST will be solely for the account of WEST COAST.

Each Joint Venturer will be solely responsible for completing and warranting all Work required of it. To the greatest extent permitted by law, neither Joint Venturer will be jointly or severally liable for the work, liability or debt of the other. Each Joint Venturer will cooperate fully with the other to complete its obligations under this Agreement in a timely and efficient manner. Neither Joint Venturer will charge supervision, engineering, overhead, profits or losses, to the other. The Joint Venture will have no employees. Rather, each Joint Venturer will use its own employees to perform its obligations under this Agreement.

5. Subcontractors: Each Joint Venturer may separately contract with subcontractors and suppliers and administer any subcontracts and/or purchase orders for its portion of the Work. However, each Joint Venturer will provide the names of all subcontractors and all other information required by Public Contract Code section 4100, *et. seq.*, or the Owner, to the other Joint Venturer for inclusion in the bid.

6. Project Manager: WEST COAST will appoint and pay for a Project Manager who will, under the direction, control and authority of WEST COAST, be responsible for the direction and management of the West Coast's portion of the Project in accordance with policies and procedures established by the Joint Venturers, coordinate the work on the Project, and be responsible for necessary contracts with the Owner and its representatives. PK Mechanical will do the same for their portion of the project.

7. Schedule: WEST COAST and PK Mechanical will agree to a construction schedule.

8. Record Keeping: Each Joint Venturer will separately maintain books of account with respect to its performance of the Work allocated to it under this Agreement, and will assume, among other things, the payment of all payroll taxes, payroll insurance premiums, property taxes, sales-use taxes, State and Federal income taxes, license fees, permits, and other costs that pertain to and arise out of its performance of the Work allocated to it. Each Joint Venturer will be responsible for and file the appropriate reports or returns concerning the performance of its share of the Work, and will report all payments, income, costs and expenses attributable to such Joint Venturer's performance of the Work on its own Federal and State income tax returns. Except as otherwise required by applicable law, the Joint Venture will not file Federal or State tax or other returns.

9. Bank Account And Payments: A bank account for the Joint Venture will be opened in a bank selected by the Joint Venturers and all funds received from the Owner shall be endorsed by both Joint Venturers and deposited into said account. Payments to WEST COAST or PK Mechanical, pursuant to paragraph 4, will be made within two days of receipt of payment from the Owner,

Initials: _____ / _____
WEST COAST (PK Mechanical)

and any pay estimate on which payment is made will be the basis for payment to the Joint Venturers. Both parties will receive copies of the monthly bank statements for both the Joint Venture account and the retention account.

10. Accounting: A separate ledger for the Joint Venture will be kept and maintained by WEST COAST for the entry of all accounts in connection with the Contract. All books of account, records, vouchers, contracts and data of any character relating to the performance of the Contract will be open to examination and copying by either Joint Venturer.

11. Payment Of Subcontractors: If a subcontractor or supplier is used by a Joint Venturer, that Joint Venturer will pay its subcontractor's or supplier's invoices from funds received for its scope of Work. Each Joint Venturer will copy and forward all subcontractor and supplier lien releases to the other Joint Venturer to allow each Joint Venturer to maintain complete job payment records.

12. Punchlist Items: Each Joint Venturer agrees to provide, at its own expense, all requirements of the Owner in the performance of the Contract applicable to its portion of the Work, including, but not limited to, repair or replacement of existing facilities, cleanup and punchlist items.

13. Bid, Performance And Payment Bonds: All bid, payment and performance bonds that may be required of the Joint Venture with respect to the Project or the Contract will be furnished and paid for by WEST COAST

14. Labor Activity: If either Joint Venturer is the target of picketing or handbilling activities by or on behalf of a labor organization, that Joint Venturer will take all reasonable steps, at its own expense, to: (1) halt secondary activity by filing and prosecuting unfair labor practice charges with the National Labor Relations Board; (2) prosecuting any trespassers by means of threatening arrest or filing criminal charges; and (3) pursuing a court injunction against any mass and/or violent picketing.

15. Indemnification: Each Joint Venturer assumes full responsibility for the performance of its portion of the Work set forth in paragraph 4, above. To the greatest extent permitted by law, each Joint Venturer will defend, indemnify and hold harmless the other Joint Venturer, the Joint Venture, and the officers, directors, employees, agents and successors in interest of the other Joint Venturer, from and against any and all suits, actions, claims, demands, judgments or liabilities for damages, losses, or expenses of any kind whatsoever, including, but not limited to, injuries or death of persons and damage to property or attorneys' fees and costs, arising out of or in connection with: (a) the portion of the Work performed or required to be performed by the indemnifying Joint Venturer under this Agreement or the Contract; or (b) the indemnifying Joint Venturer's breach, default, or failure to perform or comply with any term, provision, duty, or obligation of or under this Agreement or applicable law. However, nothing in this paragraph purports to indemnify a Joint Venturer against liability for damages for death or bodily injury, damage to property or any other loss, damage or expense arising from the sole negligence or willful misconduct of the Joint Venturer or its employees, agents, servants, or independent contractors, or for any defects in design furnished by the Joint Venturer, its employees, agents, servants, or independent contractors. The indemnification provided for will continue in full force and effect after the completion of the Project and the dissolution of the Joint Venture.

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WEST COAST (PK Mechanical)

16. Insurance: Before starting work under the Contract, each Joint Venturer will obtain and provide proof of commercial general liability insurance, automobile liability insurance and workers compensation insurance all according to the types and limits of insurances required in subsection 7-8.02 of the Contract Documents.

Each Joint Venturer will be solely responsible for the payment of all premiums for the insurance coverage required of it. WEST COAST will maintain commercial general liability coverage in full force and effect, or provide for similar coverage as under the policy or policies, for a period of not less than ten (10) years from the date of actual or constructive substantial completion of the Project, as defined in California Code of Civil Procedure section 337.15, subdivision (g). WEST COAST will add PK Mechanical and the Joint Venture as additional insureds for purposes of the Contract under WEST COAST's commercial general liability insurance policy with an endorsement providing primary insurance to PK Mechanical the Joint Venture for losses arising out of West Coast's portion of the Work. PK Mechanical will add WEST COAST and the Joint as additional insureds for purposes of the Contract under PK Mechanical's commercial general liability insurance policy with an endorsement providing primary insurance to WEST COAST and the Joint Venture for losses arising out of PK Mechanical's portion of the Work.

17. Liquidated Damages: If a Joint Venturer fails to timely complete its scope of the Work resulting in the assessment of liquidated damages by the Owner, that Joint Venturer will pay the liquidated damages assessed by the Owner and will not demand contribution from the other Joint Venturer. If liquidated damages will be backcharged to a subcontractor by the Joint Venturer using the subcontractor, the Joint Venturers will agree how the liquidated damages are to be applied before deductions are taken from payment by the Owner. If the construction schedule indicates a potential for liquidated damages, then a meeting of the Joint Venturers will be held within two (2) weeks of identification of the schedule delay and a determination of responsibility and/or liability for liquidated damages decided within two (2) weeks of the meeting.

18. Backcharges: Neither Joint Venturer has the authority to backcharge the other for defective work or otherwise, without a work order signed by each.

19. Taxes And Fees: All permits, fees, licenses, and local taxes are to be paid and/or obtained by each respective Joint Venturer or Joint Venturer's subcontractor, as they may pertain to their items of Work. The Joint Venture license bond premium and any necessary municipality business license fees for the Joint Venture will be paid by WEST COAST.

20. Term: The relationship between the Joint Venturers is limited to the performance of the Contract under the terms of this Agreement, which is construed and deemed to be a Joint Venture for the performance only of the Contract. This Agreement does not constitute the Joint Venturers partners or either Joint Venturer the general agent of the other, or in any manner limit either of the Joint Venturers in the conduct of their respective businesses or activities in the making of other contracts or the performance of other work, or impose any liability except that of performance of the terms, provisions and conditions of this Agreement. This Agreement will terminate upon completion of the Project and the Contract.

Initials: _____ / DKS
WEST COAST (PK Mechanical)

21. Project Closeout: On completion of performance of the Project and the Contract, the Joint Venturers will settle and adjust all accounts in connection with the performance of the Project and the Contract.

22. Bankruptcy: In the event of the bankruptcy or insolvency of a Joint Venturer, the bankrupt or insolvent Joint Venturer, from and after the date of bankruptcy or insolvency, will cease to have any say or voice in the management of the Project and the Contract, and wherever it is provided in this Agreement that the act, consent or decision of the Joint Venturers are required, it is deemed to mean the act, consent or decision of the solvent Joint Venturer. However, the insolvent Joint Venturer will remain liable for its share of any losses and will be entitled to receive its share of the profits, if any, as provided in this Agreement, for the Work performed by the bankrupt or insolvent Joint Venturer. Should such insolvency cause damage or extra cost to the other Joint Venturer, such damage or extra cost shall be charged against the interest of the insolvent Joint Venturer.

23. Joint Venturer Creditors: The right of a creditor, receiver, trustee, assignee, garnishee, executor or administrator to assert any claim against the right, title and interest of either Joint Venturer, is limited solely to the right to claim or receive after completion of the Project and the Contract and after the closing of the accounts of the Joint Venture, the distributive share of such debtor and then only subject to the equities and prior rights of the other Joint Venturer.

24. Arbitration: Any controversy or claim arising out of or relating to this Agreement shall be submitted to binding arbitration in San Diego, California within 60 days of a Joint Venturer's demand. The arbitrator will be agreed upon by the Joint Venturers or appointed by a court. Any award rendered by the arbitrator may be entered as a final judgment in any court of competent jurisdiction.

25. Attorneys' Fees: In the event either Joint Venturer commences any action or proceeding against the other by reason of any breach or claimed breach of any provision of this Agreement, commences any action or proceeding in any way connected with this Agreement, or seeks a judicial declaration of rights under this Agreement, the Joint Venturer prevailing in such action or proceeding shall be entitled to recover from the other Joint Venturer, the prevailing Joint Venturer's reasonable attorneys' fees and costs including, but not limited to, expert witness fees, witness fees, and any and all other fees and costs, whether or not the proceeding or action proceeds to judgment.

26. Successors: The foregoing provisions and stipulations of this Agreement will bind the Joint Venturers and their respective successors and assigns.

27. No Oral Modifications: Any change to this Agreement must be in writing, signed by the Joint Venturers.

28. Headings: The headings of the paragraphs to this Agreement are for reference purposes only and are not to be used for the purpose of construing the language used in the paragraphs.

Initials: _____ / _____
WEST COAST (PK Mechanical)

IN WITNESS WHEREOF, the Joint Venturers have read this Agreement, agree to its terms and conditions and have executed and delivered this Agreement on the dates set forth below.

DATED: 4/3/17

WEST COAST GENERAL CORPORATION,
a California Corporation

By: _____
David E. Davey, President

DATED: 4/3/17

PK MECHANCICAL SYSTEMS, INC.
a California Corporation

By: _____
David R. Spindler, President

Initials: _____ / DRS
WEST COAST (PK Mechanical)

ADDENDUM A

This Addendum "A" is incorporated into the West Coast General Corporation/ PK Mechanical Systems, Inc., a joint venture agreement dated March 27, 2017 as a part of that agreement.

All grants, covenants, provisions and claims, rights powers, privileges and liabilities of the Contract shall be construed and held to be several as well as joint. Any notice or communication required to be or that may be given by the Owner or Construction Manager to the Contractor, shall be deemed given to all entities being the Contractor if given to West Coast General Corporation. Any notice, request or other communication given by West Coast General Corporation to the Owner or the Construction Manager under this contract shall be deemed to have been given by and shall bind all entities being the Contractor. The Joint Venture designates David E. Davey, West Coast General Corporation, as the representative and David Spindler, PK Mechanical Systems, Inc. as the alternate representative. The representative and the alternate shall have full authority to bind all Joint Venture partners

DATE: March 27, 2017	DATE: March 27, 2017
WEST COAST GENERAL CORPORATION	PK MECHANICAL SYSTEMS, INC.
BY:	BY:
TITLE: DAVID E. DAVEY, PRESIDENT	TITLE: DAVID R. SPINDLER, PRESIDENT