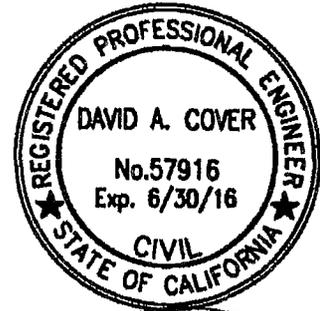


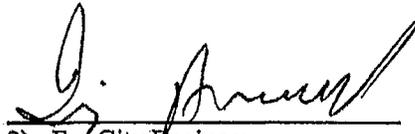
ENGINEER OF WORK

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


1) Registered Engineer 3/12/15
Date

Seal:




2) For City Engineer 3/16/15
Date

Seal

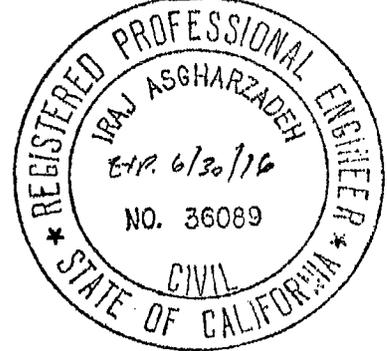


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CITY OF SAN DIEGO, CALIFORNIA

NOTICE INVITING BIDS

1. **RECEIPT AND OPENING OF BIDS:** Bids will be received at the Public Works Contracts at the location, time, and date shown on the cover of these specifications for performing work on **MBC - Chemical System Improvements - Phase II** (Project).
2. **SUMMARY OF WORK:** The Work involves furnishing all labor, materials, equipment, services, and other incidental works and appurtenances for the construction of the Project as described in ATTACHMENT A.
3. **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.
4. **SUBCONTRACTING PARTICIPATION PERCENTAGES:**
 - 4.1. 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.
 - 4.2. 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.
 - 4.3. 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.
 - 4.4. Following are federally subcontracting participation percentages for this contract. For the purpose of achieving the subcontractor participation percentage, Additive or Deductive, and Type II Allowance Bid Items will not be included in the calculation.
 - 4.5. **California State Water Resources Control Board - Clean Water State Revolving Fund (CWSRF):**

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

4.6. The Bid will be declared **non-responsive** if the Bidder fails any of the following conditions:

1. Submission of GFE documentation, as specified in the Special Provisions.
2. Attending the Pre-Submittal Meeting.
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.

4.7. For additional Equal Opportunity Contracting Program requirements, see Attachment C.

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

5. PRE-BID MEETING:

5.1. There will be a Pre-Bid Meeting to discuss the scope of the Project, bidding requirements, pre-qualification process, and Equal Opportunity Contracting Program requirements and reporting procedures in the Public Works Contracts, Conference Room at 1010 Second Avenue, 14th Floor, San Diego, CA 92101 at **10:00 A.M., on APRIL 8, 2015.**

5.2. **The Pre-Bid Meeting has been designated as MANDATORY. All potential bidders are required to attend.** Bid will be declared **non-responsive** if the Bidder fails to attend the Pre-Bid Meeting when specified to be mandatory. Attendance at the Pre-Bid Meeting will be evidenced by the representative's signature on the attendance roster. It shall be the responsibility of the Bidder's representative to complete and sign the attendance roster. **No Bidder will be admitted after the specified start time of the mandatory Pre-Bid Meeting.**

5.3. To request a copy of the agenda on an alternative format, or to request a sign language or oral interpreter for this meeting, call the Public Works Contracts at (619) 533-3450 at least 5 Working Days prior to the Pre-Bid Meeting to ensure availability.

6. CONTRACTOR REGISTRATION AND ELECTRONIC REPORTING SYSTEM:

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

<http://www.sandiego.gov/purchasing/bids-contracts/vendorreg.shtml>.

- 6.2. 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.
7. **PRE-BID SITE VISIT:** The prospective Bidders 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. A Pre-Bid Site Visit is offered when the details are provided as follows:
 - Time: 1:00 P.M.**
 - Date: April 8, 2015**
 - Location: Metropolitan Biosolids Center (MBC)
5240 Convoy, San Diego, CA 92111**
8. **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.
9. **PREVAILING WAGE RATES:** Refer to Attachment D, Funding Agency Provisions.
10. **INSURANCE REQUIREMENTS:**
 - 10.1. 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.
 - 10.2. 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.
11. **PREQUALIFICATION OF CONTRACTORS:**
 - 11.1. Contractors submitting Bid must be pre-qualified for the total amount proposed, inclusive of 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 will be deemed **non-responsive** and ineligible for award. Complete information and prequalification questionnaires are available at:
 - <http://www.sandiego.gov/cip/bidopps/prequalification.shtml>
 - 11.2. The completed questionnaire, financial statement, and bond letter or a copy of the contractor's SLBE-ELBE certification and bond letter, must be submitted no later than 2 weeks prior to the bid opening to the Public Works Contracts, Prequalification Program, 1010 Second Avenue, 14th Floor, San Diego, CA 92101. For additional

information or the answer to questions about the prequalification program, contact David Stucky at 619-533-3474 or dstucky@sandiego.gov.

12. **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
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		

13. **CITY'S RESPONSES AND ADDENDA:** The City at its option, may respond to any or all questions submitted in writing, via letter, or FAX in the form of an addendum. No oral comment 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 on the form provided for this purpose in the Bid.
14. **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.
15. **CONTRACT PRICING FORMAT:** This solicitation is for a Lump Sum contract with Unit Price provisions as set forth in the Bid Proposal Form(s), Volume 2.
16. **SUBMITTAL OF "OR EQUAL" ITEMS:** See Section 4-1.6, "Trade Names or Equals" in The WHITEBOOK and as amended in the SSP.

17. AWARD PROCESS:

17.1. The Award of this contract is contingent upon the Contractor's compliance with all conditions precedent to Award.

17.2. 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.

17.3. This contract will be deemed executed, and effective, only upon the signing of the Contract by the Mayor or designee of the City.

18. 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.

19. 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.

20. SUBMISSION OF QUESTIONS:

20.1. The Director (or designee), of the Public Works Department is the officer responsible for opening, examining, and evaluating the competitive Bids submitted to the City for the acquisition, construction and completion of any public improvement except when otherwise set forth in these documents. 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 listed on the front cover hereof]

OR:

Email address of the Contract Specialist listed on the front cover hereof.

20.2. Questions received less than 14 days prior to the date for opening of Bids may not be considered.

20.3. Clarifications deemed by the City to be material shall be issued by Addenda and uploaded to the City's online bidding service.

20.4. Only questions answered by formal written addenda will be binding. Oral and other interpretations or clarifications will be without legal effect. It is the Bidder's

responsibility to become informed of any Addenda that have been issued and to include all such information in its Bid.

21. **ELIGIBLE BIDDERS:** 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.
22. **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 with the Notice Inviting Bids and Contract forms.
23. **PROPOSAL FORMS:** Bid shall be made only upon the Bidding Documents i.e., Proposal form attached to and forming a part of the specifications. The signature of each person signing shall be in longhand.
 - 23.1. Bidder shall complete and submit all pages in the "Bidding Document" Section (see Volume 2) as their Bid per the schedule given under "Required Documents Schedule," (see Volume 1). Bidder is requested to retain for their reference other portions of the Contract Documents that are not required to be submitted with the Bid. The entire specifications for the bid package do not need to be submitted with the bid.
 - 23.2. The City may require any Bidder to furnish a statement of experience, financial responsibility, technical ability, equipment, and references.
 - 23.3. Bids and certain other forms and documents as specified in the Volume 2 of 2 of the Contract Documents shall be enclosed in a sealed envelope and shall bear the title of the work and name of the Bidder and the appropriate State Contractors License designation which the Bidder holds.
 - 23.4. Bids may be withdrawn by the Bidder prior to, but not after, the time fixed for opening of Bids.
24. **BIDDER'S GUARANTEE OF GOOD FAITH (BID SECURITY):**
 - 24.1. 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.
 - 24.2. 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.

- 24.3. 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.
- 24.4. A Bid received without the specified bid security may be rejected as **non-responsive**.
- 25. AWARD OF CONTRACT OR REJECTION OF BIDS:**
- 25.1. This contract may be awarded to the lowest responsible and reliable Bidder.
- 25.2. Bidders shall complete the entire Bid schedule (also referred to as "schedule of prices" or Proposal form). Incomplete price schedules will be rejected as being non-responsive.
- 25.3. The City reserves the right to reject any or all Bids, and to waive any informality or technicality in Bids received and any requirements of these specifications as to bidding procedure.
- 25.4. Bidders will not be released on account of their errors of judgment. Bidders may be released only upon receipt by the City from the Bidder within 3 Working Days, excluding Saturdays, Sundays, and state holidays, after the opening of Bids, of written notice which includes proof of honest, credible, clerical error of material nature, free from fraud or fraudulent intent, and of evidence that reasonable care was observed in the preparation of the Bid.
- 25.5. A non-selected Bidder may protest award of the Contract to the selected Bidder by submitting a written "Notice of Intent to Protest" including supporting documentation which shall be received by Public Works Contracts no later than 10 days after the City's announcement of the selected Bidder or no later than 10 days from the date that the City issues notice of designation of a Bidder as non-responsive in accordance with San Diego Municipal Code Chapter 2, § 22.3029, "Protests of Contract Award."
- 25.6. The City of San Diego will not discriminate with regard to race, religious creed, color, national origin, ancestry, physical handicap, marital status, sex or age, in the award of contracts.
- 25.7. Each Bid package properly executed as required by these specifications shall constitute a firm offer, which may be accepted by the City within the time specified in the Proposal.
- 25.8. The City reserves the right to evaluate all Bids and determine the lowest Bidder on the basis of any proposed alternates, additive items or options, at its discretion that will be disclosed in the Volume 2 of 2.

26. BID RESULTS:

- 26.1. The Bid opening by the City 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 public announcement will be posted in the City's web page <http://www.sandiego.gov/cip/index.shtml>, with the name of the newly designated Apparent Low Bidder.
- 26.2. To obtain Bid results, either attend Bid opening, review the results on the City's web site, or provide a self-addressed, stamped envelope, referencing Bid number, and Bid tabulation will be mailed to you upon verification of extensions. Bid results cannot be given over the telephone.

27. THE CONTRACT:

- 27.1. 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.
- 27.2. 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.
- 27.3. 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.
- 27.4. 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.
- 27.5. 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. 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.

- 28. 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.
- 29. CITY STANDARD PROVISIONS:** This contract is subject to the following standard provisions. See The WHITEBOOK for details.
- 29.1.** The City of San Diego Resolution No. R-277952 adopted on May 20, 1991 for a Drug-Free Workplace.
- 29.2.** The City of San Diego Resolution No. R-282153 adopted on June 14, 1993 related to the Americans with Disabilities Act.
- 29.3.** The City of San Diego Municipal Code §22.3004 for Pledge of Compliance.
- 29.4.** The City of San Diego's Labor Compliance Program and the State of California Labor Code §§1771.5(b) and 1776.
- 29.5.** 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.
- 29.6.** The City's Equal Benefits Ordinance (EBO), Chapter 2, Article 2, Division 43 of The San Diego Municipal Code (SDMC).
- 29.7.** The City's Information Security Policy (ISP) as defined in the City's Administrative Regulation 90.63.
- 30. PRE-AWARD ACTIVITIES:**
- 30.1.** The selected contractor by the City to execute a contract for this Work shall provide the information required within the time specified in "Required Documents," of this bid package. Failure to provide the information within the time specified may result in the Bid being rejected as **non-responsive**.
- 30.2.** If the Bid is rejected as non-responsive, the selected contractor by the City to execute a contract for this Work shall forfeit the required Bid. The decision that the selected contractor by the City to execute a contract for this Work is non-responsive for failure to provide the information required within the time specified shall be at the sole discretion of the City.

31. PHASED FUNDING:

For additional Phased Funding Provisions, see Attachment B.

32. REQUIRED DOCUMENT SCHEDULE:

32.1. The Bidder's attention is directed to the City's Municipal Code §22.0807(e), (3)-(5) for important information regarding grounds for debarment for failure to submit required documentation.

32.2. The specified Equal Opportunity Contracting Program (EOCP) forms are available for download from the City's web site at:

<http://www.sandiego.gov/eoc/forms/index.shtml>

ITEM	WHEN DUE	FROM	DOCUMENT TO BE SUBMITTED
1.	BID SUBMITTAL DATE/TIME	ALL BIDDERS	Bid
2.	BID SUBMITTAL DATE/TIME	ALL BIDDERS	Bid Bond
3.	BID SUBMITTAL DATE/TIME	ALL BIDDERS	Non-collusion Affidavit to be Executed By Bidder and Submitted with Bid under 23 USC 112 and PCC 7106
4.	BID SUBMITTAL DATE/TIME	ALL BIDDERS	Contractors Certification of Pending Actions
5.	BID SUBMITTAL DATE/TIME	ALL BIDDERS	Equal Benefits Ordinance Certification of Compliance
6.	BID SUBMITTAL DATE/TIME	ALL BIDDERS	Lobby Prohibition, Certification and Disclosure
7.	BID SUBMITTAL DATE/TIME	ALL BIDDERS	Instructions for Completion of SF-LLL, Disclosure of Lobbying Activities
8.	BID SUBMITTAL DATE/TIME	ALL BIDDERS	Disclosure of Lobbying Activities
9.	BID SUBMITTAL DATE/TIME	ALL BIDDERS	Form AA35 - List of Subcontractors
10.	BID SUBMITTAL DATE/TIME	ALL BIDDERS	Form AA40 - Named Equipment/Material Supplier List
11.	BID SUBMITTAL DATE/TIME	ALL BIDDERS	EPA FORM 6100-3 – DBE Subcontractor Performance Form

ITEM	WHEN DUE	FROM	DOCUMENT TO BE SUBMITTED
12.	BID SUBMITTAL DATE/TIME	ALL BIDDERS	EPA FORM 6100-4 – DBE Subcontractor Utilization Form
13.	WITHIN 4 WORKING DAYS OF BID OPENING	ALL BIDDERS	Federal Good Faith Documentation
14.	WITHIN 4 WORKING DAYS OF BID OPENING WITH GOOD FAITH EFFORT DOCUMENTATION	ALL BIDDERS	Proof of Valid DBE-MBE-WBE-DVBE Certification Status e.g., Certs.
15.	WITHIN 4 WORKING DAYS OF BID OPENING WITH GOOD FAITH EFFORT DOCUMENTATION	ALL BIDDERS	Form AA61 – List of Work Made Available
16.	WITHIN 4 WORKING DAYS OF BID OPENING WITH GOOD FAITH EFFORT DOCUMENTATION	ALL BIDDERS	CWSRF Form 1 - Good Faith Effort List of Subcontractors Solicited
17.	WITHIN 4 WORKING DAYS OF BID OPENING WITH GOOD FAITH EFFORT DOCUMENTATION	ALL BIDDERS	CWSRF Form 2 - Good Faith Effort Bids Received List
18.	WITHIN 4 WORKING DAYS OF BID OPENING WITH GOOD FAITH EFFORT DOCUMENTATION	ALL BIDDERS	CWSRF Form 3 - DBE Contractor Certification
19.	WITHIN 4 WORKING DAYS OF BID OPENING WITH GOOD FAITH EFFORT DOCUMENTATION	ALL BIDDERS	CWSRF Form 4 - Prime Contractor/Recipient Selected DBEs
20.	WITHIN 4 WORKING DAYS OF BID OPENING WITH GOOD FAITH EFFORT DOCUMENTATION	ALL BIDDERS	CWSRF Form 5 - Summary of Bids Received from Subcontractors
21.	WITHIN 5 WORKING DAYS AFTER RECEIPT OF APPROVAL OF GOOD FAITH EFFORT DOCUMENTATION	APPARENT LOW BIDDER	Contractor's Experience and Past Project Documentation. See Section 01080 – Part 6.
22.	WITHIN 10 WORKING DAYS AFTER RECEIPT BY BIDDER OF CONTRACT FORMS	APPARENT LOW BIDDER	Phased Funding Schedule Agreement (when required)

ITEM	WHEN DUE	FROM	DOCUMENT TO BE SUBMITTED
23.	WITHIN 10 WORKING DAYS AFTER RECEIPT BY BIDDER OF CONTRACT FORMS	APPARENT LOW BIDDER	Pre-Award Schedule (Phased Funded Contracts Only)
24.	WITHIN 10 WORKING DAYS AFTER RECEIPT BY BIDDER OF CONTRACT FORMS	APPARENT LOW BIDDER	Names of the principal individual owners of the Apparent Low Bidder
25.	WITHIN 10 WORKING DAYS AFTER RECEIPT BY BIDDER OF CONTRACT FORMS	APPARENT LOW BIDDER	If the Contractor is a Joint Venture: <ul style="list-style-type: none"> • Joint Venture Agreement • Joint Venture License
26.	WITHIN 10 WORKING DAYS AFTER RECEIPT BY BIDDER OF CONTRACT FORMS	APPARENT LOW BIDDER	Form BB05 - Work Force Report
27.	WITHIN 10 WORKING DAYS AFTER RECEIPT BY BIDDER OF CONTRACT FORMS	APPARENT LOW BIDDER	Contract Forms - Agreement
28.	WITHIN 10 WORKING DAYS AFTER RECEIPT BY BIDDER OF CONTRACT FORMS	APPARENT LOW BIDDER	Contract Forms - Payment and Performance Bond
29.	WITHIN 10 WORKING DAYS AFTER RECEIPT BY BIDDER OF CONTRACT FORMS	APPARENT LOW BIDDER	Certificates of Insurance and Endorsements
30.	WITHIN 10 WORKING DAYS AFTER RECEIPT BY BIDDER OF CONTRACT FORMS	APPARENT LOW BIDDER	Contractor Certification - Drug-Free Workplace
31.	WITHIN 10 WORKING DAYS AFTER RECEIPT BY BIDDER OF CONTRACT FORMS	APPARENT LOW BIDDER	Contractor Certification - American with Disabilities Act
32.	WITHIN 10 WORKING DAYS AFTER RECEIPT BY BIDDER OF CONTRACT FORMS	APPARENT LOW BIDDER	Contractors Standards - Pledge of Compliance

**CONTRACT FORMS
AGREEMENT**

CONTRACT FORMS

CONSTRUCTION CONTRACT

This contract is made and entered into between THE CITY OF SAN DIEGO, a municipal corporation, herein called "City", and Stanek Constructors, Inc., herein called "Contractor" for construction of MBC - Chemical System Improvements - Phase II Bid No. K-15-6231-DBB-3 in the amount of Four Million Five Hundred Sixty-Seven Thousand Dollars and 00/100 (\$4,567,000.00), which is comprised of the Base Bid.

IN CONSIDERATION of the payments to be made hereunder and the mutual undertakings of the parties hereto, City and Contractor agree as follows:

1. The following are incorporated into this contract as though fully set forth herein:
 - (a) The attached Faithful Performance and Payment Bonds.
 - (b) The attached Proposal included in the Bid documents by the Contractor.
 - (c) Reference Standards listed in the Notice Inviting Bids and the Supplementary Special Provisions (SSP).
 - (d) Phase Funding Schedule Agreement.
 - (e) That certain documents entitled **MBC - Chemical System Improvements - Phase II** on file in the office of the Public Works Department as Document No. **B-10178** 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 **MBC - Chemical System Improvements - Phase II**, Bid Number **K-15-6231-DBB-3**, San Diego, California.
3. For such performances, the City shall pay to Contractor the amounts set forth at the times and in the manner and with such additions or deductions as are provided for in this contract, and the Contractor shall accept such payment in full satisfaction of all claims incident to such performances.
4. No claim or suit whatsoever shall be made or brought by Contractor against any officer, agent, or employee of the City for or on account of anything done or omitted to be done in connection with this contract, nor shall any such officer, agent, or employee be liable hereunder.
5. This contract is effective as of the date that the Mayor or designee signs the agreement.

CONTRACT FORMS (continued)

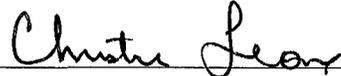
IN WITNESS WHEREOF, this Agreement is signed by the City of San Diego, acting by and through its Mayor or designee, pursuant to **Municipal Code 22.3102** authorizing such execution.

THE CITY OF SAN DIEGO

APPROVED AS TO FORM

Jan I. Goldsmith, City Attorney

By 

By 

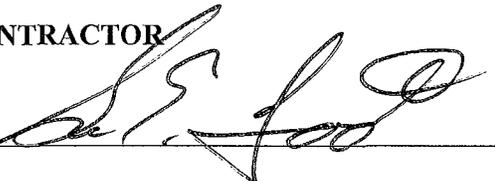
Print Name: Stephen Samara,
Principal Contract Specialist

Print Name: Christine Leone
Deputy City Attorney

Date: 8-20-15

Date: 8/20/15

CONTRACTOR

By 

Print Name: George E. Fook

Title: Vice President

Date: 7-16-15

City of San Diego License No.: B2008006605

State Contractor's License No.: 869424

**CONTRACT FORMS
ATTACHMENTS**

CONTRACT FORMS ATTACHMENTS
PERFORMANCE BOND AND LABOR AND MATERIALMEN'S BOND

FAITHFUL PERFORMANCE BOND AND LABOR AND MATERIALMEN'S BOND:

Stanek Constructors, Inc., 2434 Auto Park Way, Suite 102,*, a corporation, as principal, and Berkley Insurance Company, 475 Steamboat Road, Greenwich, CT 06830, 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 Four Million Five Hundred Sixty-Seven Thousand Dollars and 00/100 (\$4,567,000.00) for the faithful performance of the annexed contract, and in the sum of Four Million Five Hundred Sixty-Seven Thousand Dollars and 00/100 (\$4,567,000.00) for the benefit of laborers and materialmen designated below.

Conditions:

If the Principal shall faithfully perform the annexed contract **MBC - Chemical System Improvements - Phase II**, Bid Number **K-15-6231-DBB-3**, 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 Chapter 3 of Division 5 of Title I of the Government Code of the State of California or under the provisions of Section 3082 et seq. 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.

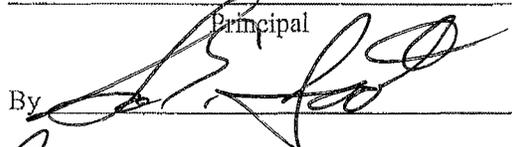
*Escondido, CA 92029

CONTRACT FORMS ATTACHMENTS (continued)
PERFORMANCE BOND AND LABOR AND MATERIALMEN'S BOND

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

Dated _____

Approved as to Form

Stanek Constructors, Inc.
Principal
By 
George E. Foot
Printed Name of Person Signing for Principal
Vice President.

Jan I. Goldsmith, City Attorney

By 
Deputy City Attorney

Berkley Insurance Company
Surety
By 
Kristen L. McCormick, Attorney-in-fact
CA License #0E46980

Approved:

By 
Stephen Samara, Principal Contract Specialist

2000 South Colorado Boulevard, Annex Building, Suite 410
Local Address of Surety

Denver, CO 80222
Local Address (City, State) of Surety

303-357-2619
Local Telephone No. of Surety

Premium \$ 34,930.00

Bond No. 0193386

IMA, Inc. CA License #0H64724

POWER OF ATTORNEY
BERKLEY INSURANCE COMPANY
WILMINGTON, DELAWARE

NOTICE: The warning found elsewhere in this Power of Attorney affects the validity thereof. Please review carefully.

KNOW ALL MEN BY THESE PRESENTS, that BERKLEY INSURANCE COMPANY (the "Company"), a corporation duly organized and existing under the laws of the State of Delaware, having its principal office in Greenwich, CT, has made, constituted and appointed, and does by these presents make, constitute and appoint: *Sheryll Shaw; Nicole L. McCollam; Sue Wood; Bradley J. Jeffress; Kristen L. McCormick; Sarah Finn; Robert L. Cohen; Robert J. Reiter; Michael Lischer, Jr.; Brandi J. Tetley; or Jennifer L. Clampert of IMA, Inc. of Denver, CO* its true and lawful Attorney-in-Fact, to sign its name as surety only as delineated below and to execute, seal, acknowledge and deliver any and all bonds and undertakings, with the exception of Financial Guaranty Insurance, providing that no single obligation shall exceed **Fifty Million and 00/100 U.S. Dollars (U.S.\$50,000,000.00)**, to the same extent as if such bonds had been duly executed and acknowledged by the regularly elected officers of the Company at its principal office in their own proper persons.

This Power of Attorney shall be construed and enforced in accordance with, and governed by, the laws of the State of Delaware, without giving effect to the principles of conflicts of laws thereof. This Power of Attorney is granted pursuant to the following resolutions which were duly and validly adopted at a meeting of the Board of Directors of the Company held on January 25, 2010:

RESOLVED, that, with respect to the Surety business written by Berkley Surety Group, the Chairman of the Board, Chief Executive Officer, President or any Vice President of the Company, in conjunction with the Secretary or any Assistant Secretary are hereby authorized to execute powers of attorney authorizing and qualifying the attorney-in-fact named therein to execute bonds, undertakings, recognizances, or other suretyship obligations on behalf of the Company, and to affix the corporate seal of the Company to powers of attorney executed pursuant hereto; and said officers may remove any such attorney-in-fact and revoke any power of attorney previously granted; and further

RESOLVED, that such power of attorney limits the acts of those named therein to the bonds, undertakings, recognizances, or other suretyship obligations specifically named therein, and they have no authority to bind the Company except in the manner and to the extent therein stated; and further

RESOLVED, that such power of attorney revokes all previous powers issued on behalf of the attorney-in-fact named; and further

RESOLVED, that the signature of any authorized officer and the seal of the Company may be affixed by facsimile to any power of attorney or certification thereof authorizing the execution and delivery of any bond, undertaking, recognizance, or other suretyship obligation of the Company; and such signature and seal when so used shall have the same force and effect as though manually affixed. The Company may continue to use for the purposes herein stated the facsimile signature of any person or persons who shall have been such officer or officers of the Company, notwithstanding the fact that they may have ceased to be such at the time when such instruments shall be issued.

IN WITNESS WHEREOF, the Company has caused these presents to be signed and attested by its appropriate officers and its corporate seal hereunto affixed this 9th day of February, 2015.

Attest:

Berkley Insurance Company

(Seal)

By Ira S. Lederman
Senior Vice President & Secretary

By Jeffrey M. Hafter
Senior Vice President

WARNING: THIS POWER INVALID IF NOT PRINTED ON BLUE "BERKLEY" SECURITY PAPER.

STATE OF CONNECTICUT)

) ss:

COUNTY OF FAIRFIELD)

Sworn to before me, a Notary Public in the State of Connecticut, this 9th day of February, 2015, by Ira S. Lederman and Jeffrey M. Hafter who are sworn to me to be the Senior Vice President and Secretary, and the Senior Vice President, respectively, of Berkley Insurance Company.

MARIA C. RUNDBAKEN
NOTARY PUBLIC
MY COMMISSION EXPIRES
APRIL 30, 2019

Maria C. Rundbaker
Notary Public, State of Connecticut

CERTIFICATE

I, the undersigned, Assistant Secretary of BERKLEY INSURANCE COMPANY, DO HEREBY CERTIFY that the foregoing is a true, correct and complete copy of the original Power of Attorney; that said Power of Attorney has not been revoked or rescinded and that the authority of the Attorney-in-Fact set forth therein, who executed the bond or undertaking to which this Power of Attorney is attached, is in full force and effect as of this date.

Given under my hand and seal of the Company, this _____ day of _____, _____.

(Seal)

Andrew M. Tuma

WARNING - Any unauthorized reproduction or alteration of this document is prohibited. This power of attorney is void unless seals are readable and the certification seal at the bottom is embossed. The background imprint, warning and confirmation (on reverse) must be in blue ink.

Instructions for Inquiries and Notices Under the Bond Attached to This Power

Berkley Surety Group is the affiliated underwriting manager for the surety business of: Acadia Insurance Company, Berkley Insurance Company, Berkley Regional Insurance Company, Carolina Casualty Insurance Company, Union Standard Insurance Company, Continental Western Insurance Company, and Union Insurance Company.

To verify the authenticity of the bond, please call (866) 768-3534 or email BSGInquiry@berkleysurety.com

Any written notices, inquiries, claims or demands to the surety on the bond to which this Rider is attached should be directed to:

**Berkley Surety Group
412 Mount Kemble Avenue
Suite 310N
Morristown, NJ 07960
Attention: Surety Claims Department**

Or

email BSGClaim@berkleysurety.com

Please include with all notices the bond number and the name of the principal on the bond. Where a claim is being asserted, please set forth generally the basis of the claim. In the case of a payment or performance bond, please identify the project to which the bond pertains.

CONTRACTOR CERTIFICATION

DRUG-FREE WORKPLACE

PROJECT TITLE: MBC - Chemical System Improvements - Phase II

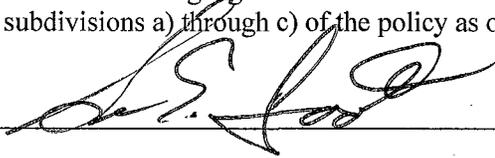
I hereby certify that I am familiar with the requirements of San Diego City Council Policy No. 100-17 regarding Drug-Free Workplace as outlined in the WHITEBOOK, Section 7-13.3, "Drug-Free Workplace", of the project specifications, and that;

Stanek Constructors, Inc

(Name under which business is conducted)

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.

Signed



Printed Name

George Foote

Title

Vice President

CONTRACTOR CERTIFICATION

AMERICAN WITH DISABILITIES ACT (ADA) COMPLIANCE CERTIFICATION

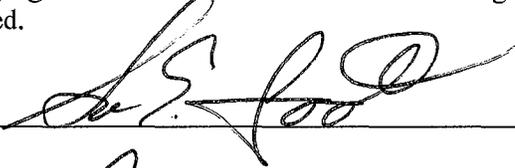
PROJECT TITLE: MBC - Chemical System Improvements - Phase II

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;

Stanek Constructors, Inc.
(Name under which business is conducted)

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.

Signed



Printed Name

George E. Foote

Title

Vice President

CONTRACTOR CERTIFICATION

CONTRACTOR STANDARDS – PLEDGE OF COMPLIANCE

PROJECT TITLE: MBC - Chemical System Improvements - Phase II

I declare under penalty of perjury that I am authorized to make this certification on behalf of Stanek Constructors, as Contractor, that I am familiar with the requirements of City of San Diego Municipal Code § 22.3224 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 § 22.3224.

Dated this 16 Day of July, 2015.

Signed 

Printed Name George Fook

Title Vice President

AFFIDAVIT OF DISPOSAL

WHEREAS, on the _____ DAY OF _____, 2____ the undersigned entered into and executed a contract with the City of San Diego, a municipal corporation, for:

MBC - Chemical System Improvements - Phase II

(Name of Project)

as particularly described in said contract and identified as Bid No. **K-15-6231-DBB-3** SAP No. (WBS/IO/CC) **B-10178** and **WHEREAS**, the specification of said contract requires the Contractor to affirm that "all brush, trash, debris, and surplus materials resulting from this project have been disposed of in a legal manner"; and **WHEREAS**, said contract has been completed and all surplus materials disposed of:

NOW, THEREFORE, in consideration of the final payment by the City of San Diego to said Contractor under the terms of said contract, the undersigned Contractor, does hereby affirm that all surplus materials as described in said contract have been disposed of at the following location(s)

and that they have been disposed of according to all applicable laws and regulations.

Dated this _____ DAY OF _____, _____.

by _____ Contractor

ATTEST:

State of _____
County of _____

On this _____ DAY OF _____, 2____, before the undersigned, a Notary Public in and for said County and State, duly commissioned and sworn, personally appeared _____ known to me to be the _____ Contractor named in the foregoing Release, and whose name is subscribed thereto, and acknowledged to me that said Contractor executed the said Release.

Notary Public in and for said County and State

ATTACHMENTS

ATTACHMENT A
SCOPE OF WORK

SCOPE OF WORK

1. **SCOPE OF WORK:** Improvements to existing chemical storage and feed systems within the active MBC facility in Area 60, 76, 80 and the pipe gallery. Demolition of existing chemical system piping, pumps, valves and appurtenances. Installation of new chemical system piping, pumps, valves, actuators, monitoring equipment and appurtenances. Removal of existing basin coating systems and installation of new coating systems. Installation of new access platforms and appurtenances. Relocation of existing eyewash showers. Removal and relocation replacement of existing electrical and control wiring and conduits. Modifications to the tank farm removable roof panels. Modifications to the existing DCS control system.
 - 1.1. The Work shall be performed in accordance with:
 - 1.1.1. The Notice Inviting Bids and Plans numbered **37240-001-D** through **37240-170-D**, inclusive.
2. **CONSTRUCTION COST:** The City's estimated construction cost for this contract is **\$4,540,000.00**.
3. **LOCATION OF WORK:** Metro Biosolids Center at 5240 Convoy, San Diego, CA 92011 – Areas 60, 76, 80 and pipe gallery.
4. **CONTRACT TIME:** The Contract Time for completion of the Work shall be **280 Working Days**.
5. **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) shall render the Bid as **non-responsive** and shall act as a bar to award of the Contract to any Bidder not possessing required license(s) at the time of Bid.
 - 5.1. The City has determined the following licensing classification 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, then within 5 Working Days after receiving notice, the next Apparent Low Bidder must provide the Pre-Award Schedule. This process will continue until the City has selected the Apparent Low Bidder or have decided to reject all Bids.
- 1.4. The first Phased Funding Schedule Agreement must show the fund availability for the first phase. Within 22 Working Days from the date of the Bid Opening or notice to the next Apparent Low Bidder (whichever occurs last) and once a Pre-Award Schedule is accepted by the City, the City will present the first Phased Funding Schedule Agreement to you when you are selected as the Apparent Low Bidder as defined in the City's Municipal Code, §22.3003.
- 1.5. At the City's request, you must meet with the City's project manager before execution of the first Phased Funding Schedule Agreement to discuss his or her comments and requests for revision to the Pre-Award Schedule.
- 1.6. Your failure to perform 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-15-6231-DBB-3

CONTRACT OR TASK TITLE: MBC - Chemical System Improvements - Phase II

CONTRACTOR: Stanek Constructors, Inc.

Funding Phase	Phase Description	Phase Start	Phase Finish	Not-to-Exceed Amount
1	Mobilization, Bonds, Submittals & Construction.	NTP	8/15/16	\$2,000,000.00
2	<u>Construction</u>	8/16/2016	NOC	\$2,567,000.00
Total				\$4,567,000.00

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

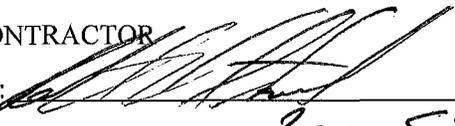
By: 

Name: Iraj Asgharzadeh, P.E.
Sr. Engineer Civil

Department Name: Public Works, E&CP

Date: 7-29-15

CONTRACTOR

By: 

Name: George E. Foote **ROBERT S. STAVALAND**

Title: Vice-President **PRESIDENT**

Date: 8-18-15

-END OF PHASED FUNDING SCHEDULE AGREEMENT-

EQUAL OPPORTUNITY CONTRACTING PROGRAM

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, 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,

ATTACHMENT C
EQUAL OPPORTUNITY CONTRACTING PROGRAM

Phase Funding Cash Flow Field Order Allowance Start

WBS

Activity ID	Activity Name	Early Start	Early Finish	01-Oct-15 - 31-Oct-16	Oct 2015	Nov 2015	Dec 2015	Jan 2016	Feb 2016	Mar 2016	Apr 2016	May 2016	Jun 2016	Jul 2016	Aug 2016	Sep 2016	Oct 2016	Period Total	
15117 MBC Chem Improvements Phase Funding																			
15117.100 Milestones																			
100	NTP	01-Oct-15 08:00 AM	01-Oct-15 05:00 PM	Period Cost														\$0	
				Cumulative Cost														\$0	
110	Field Orders - Type II	21-Oct-15 08:00 AM	21-Oct-15 05:00 PM	Period Cost	\$450,000													\$450,000	
				Cumulative Cost	\$450,000	\$450,000	\$450,000	\$450,000	\$450,000	\$450,000	\$450,000	\$450,000	\$450,000	\$450,000	\$450,000	\$450,000	\$450,000	\$450,000	\$450,000
120	Mobilization, Bonds, Permits, Fees, Notices, SWPPP	02-Oct-15 08:00 AM	20-Oct-15 05:00 PM	Period Cost	\$133,000													\$133,000	
				Cumulative Cost	\$133,000	\$133,000	\$133,000	\$133,000	\$133,000	\$133,000	\$133,000	\$133,000	\$133,000	\$133,000	\$133,000	\$133,000	\$133,000	\$133,000	\$133,000
130	Final Completion	06-Oct-16 08:00 AM	06-Oct-16 05:00 PM	Period Cost														\$0	
				Cumulative Cost														\$0	
Subtotal				Period Cost	\$583,000													\$583,000	
				Cumulative Cost	\$583,000	\$583,000	\$583,000	\$583,000	\$583,000	\$583,000	\$583,000	\$583,000	\$583,000	\$583,000	\$583,000	\$583,000	\$583,000	\$583,000	
15117.1000 Area 60 Improvements																			
1000	Tank Farm Structural Work	21-Oct-15 08:00 AM	05-Oct-16 05:00 PM	Period Cost	\$13,061	\$29,388	\$34,286	\$32,653	\$34,286	\$37,551	\$34,286	\$35,918	\$35,918	\$34,286	\$37,551	\$35,918	\$4,898	\$400,000	
				Cumulative Cost	\$13,061	\$42,449	\$76,735	\$109,388	\$143,673	\$181,224	\$215,510	\$251,429	\$287,347	\$321,633	\$359,184	\$395,102	\$400,000	\$400,000	
1010	Polymer Mixing Work	21-Oct-15 08:00 AM	11-Dec-15 05:00 PM	Period Cost	\$193,012	\$434,277	\$217,139											\$844,428	
				Cumulative Cost	\$193,012	\$627,289	\$844,428	\$844,428	\$844,428	\$844,428	\$844,428	\$844,428	\$844,428	\$844,428	\$844,428	\$844,428	\$844,428	\$844,428	\$844,428
1020	Polymer Bulk Storage Work	14-Dec-15 08:00 AM	03-Feb-16 05:00 PM	Period Cost			\$225,404	\$375,673	\$56,351									\$657,428	
				Cumulative Cost			\$225,404	\$601,077	\$657,428	\$657,428	\$657,428	\$657,428	\$657,428	\$657,428	\$657,428	\$657,428	\$657,428	\$657,428	
1030	Ferric Chloride Work	04-Feb-16 08:00 AM	23-Mar-16 05:00 PM	Period Cost					\$189,992	\$179,436								\$369,428	
				Cumulative Cost					\$189,992	\$369,428	\$369,428	\$369,428	\$369,428	\$369,428	\$369,428	\$369,428	\$369,428	\$369,428	
1040	Ferrous Chloride Work	24-Mar-16 08:00 AM	11-May-16 05:00 PM	Period Cost						\$67,616	\$236,657	\$90,155						\$394,428	
				Cumulative Cost						\$67,616	\$304,273	\$394,428	\$394,428	\$394,428	\$394,428	\$394,428	\$394,428	\$394,428	
1050	Sulfuric Acid Work	12-May-16 08:00 AM	29-Jun-16 05:00 PM	Period Cost								\$147,771	\$221,657					\$369,428	
				Cumulative Cost								\$147,771	\$369,428	\$369,428	\$369,428	\$369,428	\$369,428	\$369,428	
1060	Sodium Hypochlorite Work	30-Jun-16 08:00 AM	17-Aug-16 05:00 PM	Period Cost									\$7,555	\$158,657	\$98,216			\$264,428	
				Cumulative Cost									\$7,555	\$166,212	\$264,428	\$264,428	\$264,428	\$264,428	
1070	Caustic Soda Work	18-Aug-16 08:00 AM	05-Oct-16 05:00 PM	Period Cost											\$102,695	\$225,929	\$30,808	\$359,432	
				Cumulative Cost											\$102,695	\$328,624	\$359,432	\$359,432	
Subtotal				Period Cost	\$206,073	\$463,665	\$476,828	\$408,326	\$280,628	\$284,604	\$270,943	\$273,845	\$265,130	\$192,943	\$238,462	\$261,847	\$35,706	\$3,659,000	
				Cumulative Cost	\$206,073	\$669,738	\$1,146,567	\$1,554,893	\$1,835,521	\$2,120,125	\$2,391,067	\$2,664,912	\$2,930,042	\$3,122,985	\$3,361,447	\$3,623,294	\$3,659,000	\$3,659,000	
15117.2000 Area 76 Improvements																			
2000	Ferric Chloride & Polymer Work	21-Oct-15 08:00 AM	05-Oct-16 05:00 PM	Period Cost	\$3,265	\$7,347	\$8,571	\$8,163	\$8,571	\$9,388	\$8,571	\$8,980	\$8,980	\$8,571	\$9,388	\$8,980	\$1,224	\$100,000	

Phase Funding Cash Flow Field Order Allowance Start

WBS

Activity ID	Activity Name	Early Start	Early Finish	01-Oct-15 - 31-Oct-16	Oct 2015	Nov 2015	Dec 2015	Jan 2016	Feb 2016	Mar 2016	Apr 2016	May 2016	Jun 2016	Jul 2016	Aug 2016	Sep 2016	Oct 2016	Period Total
				Cumulative Cost	\$3,265	\$10,612	\$19,184	\$27,347	\$35,918	\$45,306	\$53,878	\$62,857	\$71,837	\$80,408	\$89,796	\$98,776	\$100,000	\$100,000
Subtotal		21-Oct-15 08:00 AM	05-Oct-16 05:00 PM	Period Cost	\$3,265	\$7,347	\$8,571	\$8,163	\$8,571	\$9,388	\$8,571	\$8,980	\$8,980	\$8,571	\$9,388	\$8,980	\$1,224	\$100,000
				Cumulative Cost	\$3,265	\$10,612	\$19,184	\$27,347	\$35,918	\$45,306	\$53,878	\$62,857	\$71,837	\$80,408	\$89,796	\$98,776	\$100,000	\$100,000
15117.3000 Area 80 Improvements																		
3000	Ferrous Chloride Work	21-Oct-15 08:00 AM	05-Oct-16 05:00 PM	Period Cost	\$7,347	\$16,531	\$19,286	\$18,367	\$19,286	\$21,122	\$19,286	\$20,204	\$20,204	\$19,286	\$21,122	\$20,204	\$2,755	\$225,000
				Cumulative Cost	\$7,347	\$23,878	\$43,163	\$61,531	\$80,816	\$101,939	\$121,224	\$141,429	\$161,633	\$180,918	\$202,041	\$222,245	\$225,000	\$225,000
Subtotal		21-Oct-15 08:00 AM	05-Oct-16 05:00 PM	Period Cost	\$7,347	\$16,531	\$19,286	\$18,367	\$19,286	\$21,122	\$19,286	\$20,204	\$20,204	\$19,286	\$21,122	\$20,204	\$2,755	\$225,000
				Cumulative Cost	\$7,347	\$23,878	\$43,163	\$61,531	\$80,816	\$101,939	\$121,224	\$141,429	\$161,633	\$180,918	\$202,041	\$222,245	\$225,000	\$225,000
Subtotal		01-Oct-15 08:00 AM	06-Oct-16 05:00 PM	Period Cost	\$799,686	\$487,543	\$504,685	\$434,857	\$308,485	\$315,114	\$298,800	\$303,028	\$294,314	\$220,800	\$268,972	\$291,031	\$39,686	\$4,567,000
				Cumulative Cost	\$799,686	\$1,287,228	\$1,791,914	\$2,226,770	\$2,535,256	\$2,850,370	\$3,149,169	\$3,452,197	\$3,746,511	\$3,967,311	\$4,236,283	\$4,527,314	\$4,567,000	\$4,567,000
Total		01-Oct-15 08:00 AM	06-Oct-16 05:00 PM	Period Cost	\$799,686	\$487,543	\$504,685	\$434,857	\$308,485	\$315,114	\$298,800	\$303,028	\$294,314	\$220,800	\$268,972	\$291,031	\$39,686	\$4,567,000
				Cumulative Cost	\$799,686	\$1,287,228	\$1,791,914	\$2,226,770	\$2,535,256	\$2,850,370	\$3,149,169	\$3,452,197	\$3,746,511	\$3,967,311	\$4,236,283	\$4,527,314	\$4,567,000	\$4,567,000

Phase Funding Cash Flow Field Order Allowance Finish

WBS

Activity ID	Activity Name	Early Start	Early Finish	01-Oct-15 - 31-Oct-16	Oct 2015	Nov 2015	Dec 2015	Jan 2016	Feb 2016	Mar 2016	Apr 2016	May 2016	Jun 2016	Jul 2016	Aug 2016	Sep 2016	Oct 2016	Period Total
15117 MBC Chem Improvements Phase Funding																		
15117.100 Milestones																		
100	NTP	01-Oct-15 08:00 AM	01-Oct-15 05:00 PM	Period Cost														\$0
				Cumulative Cost														\$0
110	Field Orders - Type II	06-Oct-16 08:00 AM	06-Oct-16 05:00 PM	Period Cost													\$450,000	\$450,000
				Cumulative Cost													\$450,000	\$450,000
120	Mobilization, Bonds, Permits, Fees, Notices, SWPPP	02-Oct-15 08:00 AM	20-Oct-15 05:00 PM	Period Cost	\$133,000													\$133,000
				Cumulative Cost	\$133,000	\$133,000	\$133,000	\$133,000	\$133,000	\$133,000	\$133,000	\$133,000	\$133,000	\$133,000	\$133,000	\$133,000	\$133,000	\$133,000
130	Final Completion	06-Oct-16 08:00 AM	06-Oct-16 05:00 PM	Period Cost														\$0
				Cumulative Cost														\$0
Subtotal		01-Oct-15 08:00 AM	06-Oct-16 05:00 PM	Period Cost	\$133,000													\$450,000
				Cumulative Cost	\$133,000	\$133,000	\$133,000	\$133,000	\$133,000	\$133,000	\$133,000	\$133,000	\$133,000	\$133,000	\$133,000	\$133,000	\$133,000	\$583,000
15117.1000 Area 60 Improvements																		
1000	Tank Farm Structural Work	21-Oct-15 08:00 AM	05-Oct-16 05:00 PM	Period Cost	\$13,061	\$29,388	\$34,286	\$32,653	\$34,286	\$37,551	\$34,286	\$35,918	\$35,918	\$34,286	\$37,551	\$35,918	\$4,898	\$400,000
				Cumulative Cost	\$13,061	\$42,449	\$76,735	\$109,388	\$143,673	\$181,224	\$215,510	\$251,429	\$287,347	\$321,633	\$359,184	\$395,102	\$400,000	\$400,000
1010	Polymer Mixing Work	21-Oct-15 08:00 AM	11-Dec-15 05:00 PM	Period Cost	\$193,012	\$434,277	\$217,139											\$844,428
				Cumulative Cost	\$193,012	\$627,289	\$844,428	\$844,428	\$844,428	\$844,428	\$844,428	\$844,428	\$844,428	\$844,428	\$844,428	\$844,428	\$844,428	\$844,428
1020	Polymer Bulk Storage Work	14-Dec-15 08:00 AM	03-Feb-16 05:00 PM	Period Cost			\$225,404	\$375,673	\$56,351									\$657,428
				Cumulative Cost			\$225,404	\$601,077	\$657,428	\$657,428	\$657,428	\$657,428	\$657,428	\$657,428	\$657,428	\$657,428	\$657,428	\$657,428
1030	Ferric Chloride Work	04-Feb-16 08:00 AM	23-Mar-16 05:00 PM	Period Cost					\$189,992	\$179,436								\$369,428
				Cumulative Cost					\$189,992	\$369,428	\$369,428	\$369,428	\$369,428	\$369,428	\$369,428	\$369,428	\$369,428	\$369,428
1040	Ferrous Chloride Work	24-Mar-16 08:00 AM	11-May-16 05:00 PM	Period Cost						\$67,616	\$236,657	\$90,155						\$394,428
				Cumulative Cost						\$67,616	\$304,273	\$394,428	\$394,428	\$394,428	\$394,428	\$394,428	\$394,428	\$394,428
1050	Sulfuric Acid Work	12-May-16 08:00 AM	29-Jun-16 05:00 PM	Period Cost								\$147,771	\$221,657					\$369,428
				Cumulative Cost								\$147,771	\$369,428	\$369,428	\$369,428	\$369,428	\$369,428	\$369,428
1060	Sodium Hypochlorite Work	30-Jun-16 08:00 AM	17-Aug-16 05:00 PM	Period Cost									\$7,555	\$158,657	\$98,216			\$264,428
				Cumulative Cost									\$7,555	\$166,212	\$264,428	\$264,428	\$264,428	\$264,428
1070	Caustic Soda Work	18-Aug-16 08:00 AM	05-Oct-16 05:00 PM	Period Cost											\$102,695	\$225,929	\$30,808	\$359,432
				Cumulative Cost											\$102,695	\$328,624	\$359,432	\$359,432
Subtotal		21-Oct-15 08:00 AM	05-Oct-16 05:00 PM	Period Cost	\$206,073	\$463,665	\$476,828	\$408,326	\$280,628	\$284,604	\$270,943	\$273,845	\$265,130	\$192,943	\$238,462	\$261,847	\$35,706	\$3,659,000
				Cumulative Cost	\$206,073	\$669,738	\$1,146,567	\$1,554,893	\$1,835,521	\$2,120,125	\$2,391,067	\$2,664,912	\$2,930,042	\$3,122,985	\$3,361,447	\$3,623,294	\$3,659,000	\$3,659,000
15117.2000 Area 76 Improvements																		
2000	Ferric Chloride & Polymer Work	21-Oct-15 08:00 AM	05-Oct-16 05:00 PM	Period Cost	\$3,265	\$7,347	\$8,571	\$8,163	\$8,571	\$9,388	\$8,571	\$8,980	\$8,980	\$8,571	\$9,388	\$8,980	\$1,224	\$100,000

Phase Funding Cash Flow Field Order Allowance Finish

WBS

Activity ID	Activity Name	Early Start	Early Finish	01-Oct-15 - 31-Oct-16	Oct 2015	Nov 2015	Dec 2015	Jan 2016	Feb 2016	Mar 2016	Apr 2016	May 2016	Jun 2016	Jul 2016	Aug 2016	Sep 2016	Oct 2016	Period Total
				Cumulative Cost	\$3,265	\$10,612	\$19,184	\$27,347	\$35,918	\$45,306	\$53,878	\$62,857	\$71,837	\$80,408	\$89,796	\$98,776	\$100,000	\$100,000
Subtotal		21-Oct-15 08:00 AM	05-Oct-16 05:00 PM	Period Cost	\$3,265	\$7,347	\$8,571	\$8,163	\$8,571	\$9,388	\$8,571	\$8,980	\$8,980	\$8,571	\$9,388	\$8,980	\$1,224	\$100,000
				Cumulative Cost	\$3,265	\$10,612	\$19,184	\$27,347	\$35,918	\$45,306	\$53,878	\$62,857	\$71,837	\$80,408	\$89,796	\$98,776	\$100,000	\$100,000
15117.3000 Area 80 Improvements																		
3000	Ferrous Chloride Work	21-Oct-15 08:00 AM	05-Oct-16 05:00 PM	Period Cost	\$7,347	\$16,531	\$19,286	\$18,367	\$19,286	\$21,122	\$19,286	\$20,204	\$20,204	\$19,286	\$21,122	\$20,204	\$2,755	\$225,000
				Cumulative Cost	\$7,347	\$23,878	\$43,163	\$61,531	\$80,816	\$101,939	\$121,224	\$141,429	\$161,633	\$180,918	\$202,041	\$222,245	\$225,000	\$225,000
Subtotal		21-Oct-15 08:00 AM	05-Oct-16 05:00 PM	Period Cost	\$7,347	\$16,531	\$19,286	\$18,367	\$19,286	\$21,122	\$19,286	\$20,204	\$20,204	\$19,286	\$21,122	\$20,204	\$2,755	\$225,000
				Cumulative Cost	\$7,347	\$23,878	\$43,163	\$61,531	\$80,816	\$101,939	\$121,224	\$141,429	\$161,633	\$180,918	\$202,041	\$222,245	\$225,000	\$225,000
Subtotal		01-Oct-15 08:00 AM	06-Oct-16 05:00 PM	Period Cost	\$349,686	\$487,543	\$504,685	\$434,857	\$308,485	\$315,114	\$298,800	\$303,028	\$294,314	\$220,800	\$268,972	\$291,031	\$489,686	\$4,567,000
				Cumulative Cost	\$349,686	\$837,228	\$1,341,914	\$1,776,770	\$2,085,256	\$2,400,370	\$2,699,169	\$3,002,197	\$3,296,511	\$3,517,311	\$3,786,283	\$4,077,314	\$4,567,000	\$4,567,000
Total		01-Oct-15 08:00 AM	06-Oct-16 05:00 PM	Period Cost	\$349,686	\$487,543	\$504,685	\$434,857	\$308,485	\$315,114	\$298,800	\$303,028	\$294,314	\$220,800	\$268,972	\$291,031	\$489,686	\$4,567,000
				Cumulative Cost	\$349,686	\$837,228	\$1,341,914	\$1,776,770	\$2,085,256	\$2,400,370	\$2,699,169	\$3,002,197	\$3,296,511	\$3,517,311	\$3,786,283	\$4,077,314	\$4,567,000	\$4,567,000

Phase Funding Cash Flow Field Order Allowance Full Term

WBS

Activity ID	Activity Name	Early Start	Early Finish	01-Oct-15 - 31-Oct-16	Oct 2015	Nov 2015	Dec 2015	Jan 2016	Feb 2016	Mar 2016	Apr 2016	May 2016	Jun 2016	Jul 2016	Aug 2016	Sep 2016	Oct 2016	Period Total
15117 MBC Chem Improvements Phase Funding																		
15117.100 Milestones																		
100	NTP	01-Oct-15 08:00 AM	01-Oct-15 05:00 PM	Period Cost														\$0
				Cumulative Cost														\$0
110	Field Orders - Type II	21-Oct-15 08:00 AM	05-Oct-16 05:00 PM	Period Cost	\$14,694	\$33,061	\$38,571	\$36,735	\$38,571	\$42,245	\$38,571	\$40,408	\$40,408	\$38,571	\$42,245	\$40,408	\$5,510	\$450,000
				Cumulative Cost	\$14,694	\$47,755	\$86,327	\$123,061	\$161,633	\$203,878	\$242,449	\$282,857	\$323,265	\$361,837	\$404,082	\$444,490	\$450,000	\$450,000
120	Mobilization, Bonds, Permits, Fees, Notices, SWPPP	02-Oct-15 08:00 AM	20-Oct-15 05:00 PM	Period Cost	\$133,000													\$133,000
				Cumulative Cost	\$133,000	\$133,000	\$133,000	\$133,000	\$133,000	\$133,000	\$133,000	\$133,000	\$133,000	\$133,000	\$133,000	\$133,000	\$133,000	\$133,000
130	Final Completion	06-Oct-16 08:00 AM	06-Oct-16 05:00 PM	Period Cost														\$0
				Cumulative Cost														\$0
Subtotal		01-Oct-15 08:00 AM	06-Oct-16 05:00 PM	Period Cost	\$147,694	\$33,061	\$38,571	\$36,735	\$38,571	\$42,245	\$38,571	\$40,408	\$40,408	\$38,571	\$42,245	\$40,408	\$5,510	\$583,000
				Cumulative Cost	\$147,694	\$180,755	\$219,327	\$256,061	\$294,633	\$336,878	\$375,449	\$415,857	\$456,265	\$494,837	\$537,082	\$577,490	\$583,000	\$583,000
15117.1000 Area 60 Improvements																		
1000	Tank Farm Structural Work	21-Oct-15 08:00 AM	05-Oct-16 05:00 PM	Period Cost	\$13,061	\$29,388	\$34,286	\$32,653	\$34,286	\$37,551	\$34,286	\$35,918	\$35,918	\$34,286	\$37,551	\$35,918	\$4,898	\$400,000
				Cumulative Cost	\$13,061	\$42,449	\$76,735	\$109,388	\$143,673	\$181,224	\$215,510	\$251,429	\$287,347	\$321,633	\$359,184	\$395,102	\$400,000	\$400,000
1010	Polymer Mixing Work	21-Oct-15 08:00 AM	11-Dec-15 05:00 PM	Period Cost	\$193,012	\$434,277	\$217,139											\$844,428
				Cumulative Cost	\$193,012	\$627,289	\$844,428	\$844,428	\$844,428	\$844,428	\$844,428	\$844,428	\$844,428	\$844,428	\$844,428	\$844,428	\$844,428	\$844,428
1020	Polymer Bulk Storage Work	14-Dec-15 08:00 AM	03-Feb-16 05:00 PM	Period Cost			\$225,404	\$375,673	\$56,351									\$657,428
				Cumulative Cost			\$225,404	\$601,077	\$657,428	\$657,428	\$657,428	\$657,428	\$657,428	\$657,428	\$657,428	\$657,428	\$657,428	
1030	Ferric Chloride Work	04-Feb-16 08:00 AM	23-Mar-16 05:00 PM	Period Cost					\$189,992	\$179,436								\$369,428
				Cumulative Cost					\$189,992	\$369,428	\$369,428	\$369,428	\$369,428	\$369,428	\$369,428	\$369,428	\$369,428	
1040	Ferrous Chloride Work	24-Mar-16 08:00 AM	11-May-16 05:00 PM	Period Cost						\$67,616	\$236,657	\$90,155						\$394,428
				Cumulative Cost						\$67,616	\$304,273	\$394,428	\$394,428	\$394,428	\$394,428	\$394,428	\$394,428	
1050	Sulfuric Acid Work	12-May-16 08:00 AM	29-Jun-16 05:00 PM	Period Cost								\$147,771	\$221,657					\$369,428
				Cumulative Cost								\$147,771	\$369,428	\$369,428	\$369,428	\$369,428	\$369,428	
1060	Sodium Hypochlorite Work	30-Jun-16 08:00 AM	17-Aug-16 05:00 PM	Period Cost									\$7,555	\$158,657	\$98,216			\$264,428
				Cumulative Cost									\$7,555	\$166,212	\$264,428	\$264,428	\$264,428	
1070	Caustic Soda Work	18-Aug-16 08:00 AM	05-Oct-16 05:00 PM	Period Cost											\$102,695	\$225,929	\$30,808	\$359,432
				Cumulative Cost											\$102,695	\$328,624	\$359,432	
Subtotal		21-Oct-15 08:00 AM	05-Oct-16 05:00 PM	Period Cost	\$206,073	\$463,665	\$476,828	\$408,326	\$280,628	\$284,604	\$270,943	\$273,845	\$265,130	\$192,943	\$238,462	\$261,847	\$35,706	\$3,659,000
				Cumulative Cost	\$206,073	\$669,738	\$1,146,567	\$1,554,893	\$1,835,521	\$2,120,125	\$2,391,067	\$2,664,912	\$2,930,042	\$3,122,985	\$3,361,447	\$3,623,294	\$3,659,000	\$3,659,000
15117.2000 Area 76 Improvements																		
2000	Ferric Chloride & Polymer Work	21-Oct-15 08:00 AM	05-Oct-16 05:00 PM	Period Cost	\$3,265	\$7,347	\$8,571	\$8,163	\$8,571	\$9,388	\$8,571	\$8,980	\$8,980	\$8,571	\$9,388	\$8,980	\$1,224	\$100,000

Phase Funding Cash Flow Field Order Allowance Full Term

WBS

Activity ID	Activity Name	Early Start	Early Finish	01-Oct-15 - 31-Oct-16	Oct 2015	Nov 2015	Dec 2015	Jan 2016	Feb 2016	Mar 2016	Apr 2016	May 2016	Jun 2016	Jul 2016	Aug 2016	Sep 2016	Oct 2016	Period Total
				Cumulative Cost	\$3,265	\$10,612	\$19,184	\$27,347	\$35,918	\$45,306	\$53,878	\$62,857	\$71,837	\$80,408	\$89,796	\$98,776	\$100,000	\$100,000
Subtotal		21-Oct-15 08:00 AM	05-Oct-16 05:00 PM	Period Cost	\$3,265	\$7,347	\$8,571	\$8,163	\$8,571	\$9,388	\$8,571	\$8,980	\$8,980	\$8,571	\$9,388	\$8,980	\$1,224	\$100,000
				Cumulative Cost	\$3,265	\$10,612	\$19,184	\$27,347	\$35,918	\$45,306	\$53,878	\$62,857	\$71,837	\$80,408	\$89,796	\$98,776	\$100,000	\$100,000
15117.3000 Area 80 Improvements																		
3000	Ferrous Chloride Work	21-Oct-15 08:00 AM	05-Oct-16 05:00 PM	Period Cost	\$7,347	\$16,531	\$19,286	\$18,367	\$19,286	\$21,122	\$19,286	\$20,204	\$20,204	\$19,286	\$21,122	\$20,204	\$2,755	\$225,000
				Cumulative Cost	\$7,347	\$23,878	\$43,163	\$61,531	\$80,816	\$101,939	\$121,224	\$141,429	\$161,633	\$180,918	\$202,041	\$222,245	\$225,000	\$225,000
Subtotal		21-Oct-15 08:00 AM	05-Oct-16 05:00 PM	Period Cost	\$7,347	\$16,531	\$19,286	\$18,367	\$19,286	\$21,122	\$19,286	\$20,204	\$20,204	\$19,286	\$21,122	\$20,204	\$2,755	\$225,000
				Cumulative Cost	\$7,347	\$23,878	\$43,163	\$61,531	\$80,816	\$101,939	\$121,224	\$141,429	\$161,633	\$180,918	\$202,041	\$222,245	\$225,000	\$225,000
Subtotal		01-Oct-15 08:00 AM	06-Oct-16 05:00 PM	Period Cost	\$364,379	\$520,604	\$543,257	\$471,592	\$347,057	\$357,359	\$337,371	\$343,436	\$334,722	\$259,371	\$311,217	\$331,439	\$45,196	\$4,567,000
				Cumulative Cost	\$364,379	\$884,983	\$1,428,240	\$1,899,832	\$2,246,888	\$2,604,247	\$2,941,618	\$3,285,055	\$3,619,777	\$3,879,148	\$4,190,365	\$4,521,804	\$4,567,000	\$4,567,000
Total		01-Oct-15 08:00 AM	06-Oct-16 05:00 PM	Period Cost	\$364,379	\$520,604	\$543,257	\$471,592	\$347,057	\$357,359	\$337,371	\$343,436	\$334,722	\$259,371	\$311,217	\$331,439	\$45,196	\$4,567,000
				Cumulative Cost	\$364,379	\$884,983	\$1,428,240	\$1,899,832	\$2,246,888	\$2,604,247	\$2,941,618	\$3,285,055	\$3,619,777	\$3,879,148	\$4,190,365	\$4,521,804	\$4,567,000	\$4,567,000

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
CLEAN WATER STATE REVOLVING FUND (CWSRF)
FUNDING AGENCY PROVISIONS

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:

	<u>Goal</u>
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 actions 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 C.1. above.
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 sections 1810 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: CA150001 02/13/2015 CA1

Superseded General Decision Number: CA20140001

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: Executive Order (EO) 13658 establishes an hourly minimum wage of \$10.10 for 2015 that applies to all contracts subject to the Davis-Bacon Act for which the solicitation is 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 \$10.10 (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract. 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	01/02/2015
1	01/16/2015
2	02/13/2015

ASBE0005-002 06/30/2014

	Rates	Fringes
Asbestos Workers/Insulator (Includes the application of all insulating materials, protective coverings, coatings, and finishes to all types of mechanical systems).....	\$ 35.44	19.36
Fire Stop Technician (Application of Firestopping Materials for wall openings and penetrations in walls, floors, ceilings and curtain walls).....	\$ 24.34	16.09

ASBE0005-004 06/24/2013

	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)....	\$ 16.95	10.23

BOIL0092-003 10/01/2012

	Rates	Fringes
BOILERMAKER.....	\$ 41.17	28.27

BRCA0004-008 11/01/2014

	Rates	Fringes
BRICKLAYER; MARBLE SETTER.....	\$ 34.12	15.65

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/Scraper...\$ 11.00		6.67
(2) All other work		

Drywall Installer/Lather...\$ 27.35	9.58
Drywall Stocker/Scraper...\$ 11.00	6.67

 ELEC0569-001 12/01/2014

	Rates	Fringes
Electricians (Tunnel Work)		
Cable Splicer.....	\$ 45.75	13.25
Electrician.....	\$ 45.00	13.22
Electricians: (All Other Work, Including 4 Stories Residential)		
Cable Splicer.....	\$ 40.75	13.10
Electrician.....	\$ 40.00	13.07

 ELEC0569-005 09/01/2014

	Rates	Fringes
Sound & Communications		
Sound Technician.....	\$ 28.82	3%+10.81
Soundman.....	\$ 23.06	3%+ 9.17

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

SOUNDMAN: Wire-pulling, splicing, assembling and installing devices

SCOPE OF WORK Assembly, installation, operation, service and maintenance of components or systems as used in closed circuit television, amplified master television distribution, CATV on private property, intercommunication, burglar alarm, fire alarm, life support and all security alarms, private and public telephone and related telephone interconnect, public address, paging, audio, language, electronic, background music system less than line voltage or any system acceptable for class two wiring for private, commercial, or industrial use furnished by leased wire, frequency modulation or other recording devices, electrical apparatus by means of which electricity is applied to the amplification, transmission, transference, recording or reproduction of voice, music, sound, impulses and video. Excluded from this Scope of Work - transmission, service and maintenance of background music. All of the above shall include the installation and transmission over fiber optics.

 ELEC0569-006 10/06/2014

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.....	\$ 28.75	3%+7.42
Utility Technician #2.....	\$ 23.90	3%+7.42

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 and communication systems. The setting, leveling, grounding and racking of precast manholes, handholes and transformer pads.

ELEC0569-008 06/03/2013

	Rates	Fringes
ELECTRICIAN (Residential, 1-3 Stories).....	\$ 22.37	3%+3.30

ELEC1245-001 06/01/2013

	Rates	Fringes
LINE CONSTRUCTION		
(1) Lineman; Cable splicer..	\$ 50.30	15.00
(2) Equipment specialist (operates crawler tractors, commercial motor vehicles, backhoes, trenchers, cranes (50 tons and below), overhead & underground distribution line equipment).....	\$ 40.17	14.56
(3) Groundman.....	\$ 30.73	13.48
(4) Powderman.....	\$ 44.91	13.48

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

 ELEV0018-001 01/01/2014

	Rates	Fringes
ELEVATOR MECHANIC.....	\$ 49.03	26.785

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 07/07/2014

	Rates	Fringes
OPERATOR: Power Equipment (All Other Work)		
GROUP 1.....	\$ 39.05	22.25
GROUP 2.....	\$ 39.83	22.25
GROUP 3.....	\$ 40.12	22.25
GROUP 4.....	\$ 41.61	22.25
GROUP 5.....	\$ 41.86	22.25
GROUP 6.....	\$ 41.83	22.25
GROUP 8.....	\$ 41.94	22.25
GROUP 9.....	\$ 42.19	22.25
GROUP 10.....	\$ 42.06	22.25
GROUP 11.....	\$ 42.31	22.25
GROUP 12.....	\$ 42.23	22.25
GROUP 13.....	\$ 42.33	22.25
GROUP 14.....	\$ 42.36	22.25
GROUP 15.....	\$ 42.44	22.25
GROUP 16.....	\$ 42.56	22.25
GROUP 17.....	\$ 42.73	22.25
GROUP 18.....	\$ 42.83	22.25
GROUP 19.....	\$ 42.94	22.25
GROUP 20.....	\$ 43.06	22.25
GROUP 21.....	\$ 43.23	22.25
GROUP 22.....	\$ 43.33	22.25
GROUP 23.....	\$ 43.44	22.25
GROUP 24.....	\$ 43.56	22.25
GROUP 25.....	\$ 43.73	22.25

OPERATOR: Power Equipment
(Cranes, Piledriving &
Hoisting)

GROUP 1.....	\$ 40.40	22.25
GROUP 2.....	\$ 41.18	22.25
GROUP 3.....	\$ 41.47	22.25
GROUP 4.....	\$ 41.61	22.25
GROUP 5.....	\$ 41.83	22.25
GROUP 6.....	\$ 41.94	22.25
GROUP 7.....	\$ 42.06	22.25
GROUP 8.....	\$ 42.23	22.25
GROUP 9.....	\$ 42.40	22.25
GROUP 10.....	\$ 43.40	22.25
GROUP 11.....	\$ 44.40	22.25
GROUP 12.....	\$ 45.40	22.25
GROUP 13.....	\$ 46.40	22.25

OPERATOR: Power Equipment
(Tunnel Work)

GROUP 1.....	\$ 40.90	22.25
GROUP 2.....	\$ 41.68	22.25
GROUP 3.....	\$ 41.97	22.25
GROUP 4.....	\$ 42.11	22.25
GROUP 5.....	\$ 42.33	22.25
GROUP 6.....	\$ 42.44	22.25
GROUP 7.....	\$ 42.56	22.25

PREMIUM PAY:

\$3.75 per hour shall be paid on all Power Equipment Operator work on the following 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 (guniting 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); Pumperete 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 bending 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-Textoma 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, PILEDIVING 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 which 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 thin 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 08/01/2014

	Rates	Fringes
OPERATOR: Power Equipment		
(DREDGING)		
(1) Leverman.....	\$ 48.60	22.40
(2) Dredge dozer.....	\$ 42.63	22.40
(3) Deckmate.....	\$ 42.52	22.40
(4) Winch operator (stern winch on dredge).....	\$ 41.97	22.40
(5) Fireman-Oiler, Deckhand, Bargeman, Leveehand.....	\$ 41.43	22.40
(6) Barge Mate.....	\$ 42.04	22.40

 IRON0377-002 01/01/2015

	Rates	Fringes
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Ironworkers:		
Fence Erector.....	\$ 27.08	18.24
Ornamental, Reinforcing and Structural.....	\$ 33.50	28.20
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 07/01/2013

	Rates	Fringes
LABORER (BUILDING and all other Residential Construction)		
Group 1.....	\$ 26.98	15.42
Group 2.....	\$ 27.66	15.42
Group 3.....	\$ 28.37	15.42
Group 4.....	\$ 29.17	15.42
Group 5.....	\$ 31.10	15.42
LABORER (RESIDENTIAL CONSTRUCTION - See definition below)		
(1) Laborer.....	\$ 24.88	13.75
(2) Cleanup, Landscape, Fencing (Chain Link & Wood).	\$ 23.59	13.75

RESIDENTIAL DEFINITION: Wood or metal frame construction of single family residences, apartments and condominiums - 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 Rough 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; Kettleman, 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 11/01/2012

	Rates	Fringes
LABORER (MASON TENDER).....	\$ 27.98	13.39

LABO0089-004 07/01/2013

HEAVY AND HIGHWAY CONSTRUCTION

	Rates	Fringes
Laborers:		
Group 1.....	\$ 26.98	15.42
Group 2.....	\$ 27.66	15.42
Group 3.....	\$ 28.37	15.42

Group 4.....	\$ 29.17	15.42
Group 5.....	\$ 31.10	15.42

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, making 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, Prefabricated Manhole Installer, Sandblast Nozzleman (Water Blasting-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 tracking, 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 01/01/2014

	Rates	Fringes
Asbestos Removal Laborer.....	\$ 28.00	15.25

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 07/01/2014

	Rates	Fringes
Laborers: (HORIZONTAL DIRECTIONAL DRILLING)		
(1) Drilling Crew Laborer...	\$ 31.65	13.33
(2) Vehicle Operator/Hauler.	\$ 31.82	13.33
(3) Horizontal Directional Drill Operator.....	\$ 33.67	13.33
(4) Electronic Tracking Locator.....	\$ 35.67	13.33
Laborers: (STRIPING/SLURRY SEAL)		
GROUP 1.....	\$ 32.56	16.28
GROUP 2.....	\$ 33.86	16.28
GROUP 3.....	\$ 35.87	16.28
GROUP 4.....	\$ 37.61	16.28

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

LABO1414-003 08/07/2013

	Rates	Fringes
LABORER		
PLASTER CLEAN-UP LABORER....	\$ 27.45	16.36
PLASTER TENDER.....	\$ 30.00	16.36

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 07/01/2014

	Rates	Fringes
Painters: (Including Lead Abatement)		
(1) Repaint (excludes San Diego County).....	\$ 26.89	12.28
(2) All Other Work.....	\$ 30.27	12.28

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 10/01/2014

	Rates	Fringes
DRYWALL FINISHER/TAPER		
(1) Building & Heavy		

Construction.....	\$ 26.84	14.29
(2) Residential Construction (Wood frame apartments, single family homes and multi-duplexes up to and including four stories).....	\$ 21.00	13.91

* PAIN0036-012 12/01/2014

	Rates	Fringes
GLAZIER.....	\$ 39.80	17.33

PAIN0036-019 07/01/2014

	Rates	Fringes
SOFT FLOOR LAYER.....	\$ 26.77	12.75

PLAS0200-005 08/06/2014

	Rates	Fringes
PLASTERER.....	\$ 37.43	13.28

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

PLAS0500-001 07/01/2014

	Rates	Fringes
CEMENT MASON/CONCRETE FINISHER		
GROUP 1.....	\$ 22.29	17.10
GROUP 2.....	\$ 23.94	17.10
GROUP 3.....	\$ 26.57	17.25

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 07/01/2014

Rates Fringes

PLUMBER, PIPEFITTER,
 STEAMFITTER

Camp Pendleton.....\$ 49.21 20.36

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.....\$ 44.71 20.36

Work ONLY on new additions
 and remodeling of
 commercial buildings,
 bars, restaurants, and
 stores not to exceed 5,000
 sq. ft. of floor space.....\$ 43.33 19.38

Work ONLY on strip malls,
 light commercial, tenant
 improvement and remodel
 work.....\$ 34.59 17.71

 PLUM0016-011 07/01/2014

Rates Fringes

PLUMBER/PIPEFITTER

Residential.....\$ 36.15 16.28

 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 07/01/2013

Rates Fringes

SPRINKLER FITTER.....\$ 34.86 18.66

SHEE0206-001 01/01/2012

Rates Fringes

SHEET METAL WORKER

Camp Pendleton.....\$ 35.05 19.23
Except Camp Pendleton.....\$ 33.05 19.23
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 07/01/2012

Rates Fringes

Truck drivers:

GROUP 1.....\$ 15.40 20.50
GROUP 2.....\$ 24.99 20.50
GROUP 3.....\$ 25.19 20.50
GROUP 4.....\$ 25.39 20.50
GROUP 5.....\$ 25.59 20.50
GROUP 6.....\$ 26.09 20.50
GROUP 7.....\$ 27.59 20.50

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.

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 1(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 1(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 1(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

<http://www.dol.gov/esa/whd/forms/wh347instr.htm>

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.

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 located in Volume 2 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.

11.1.1. Semiannual DBE Utilization Reporting:

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

11.1.2. Clean Water State Revolving Fund (CWSRF) Projects Only:

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

11.1.4. The Bidder shall take affirmative steps prior to Bid opening to assure that MBE's and WBE's are used whenever possible as sources of supplies, construction and services.

11.1.5. The affirmative steps are defined for contracts funded by the California State Water Resources Control Board as follows:

1. Utilization of SBA and MBDA resources is required at no cost. These agencies offer several services, including Internet access to databases of DBEs. SBA's database is <http://www.ccr.gov/>
2. For additional assistance, the 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. There are contact phone numbers listed in Step 3 that will assist you in reaching the 2 offices if the Internet is unavailable. Do not write to these sources.
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.
4. Include qualified DBEs on solicitation lists (CWSRF Form 1) and record the information. Solicitation shall be as broad as possible. The following web sites include a list of available sources for expanding the search for eligible DBEs:
 1. <http://www.sba.gov>
 2. <http://www.ccr.gov>
 3. <http://www.mbda.gov>
5. If DBE sources are not located, explain why and describe the efforts made.
6. The Contractor shall send invitations to at least 3 (or all, if less than 3) DBE vendors for each item of the Work referred by sources contacted. The invitations shall adequately specify the items for which bids are requested. The record of GFE shall indicate a real desire for a positive response, such as a certified mail receipt or a documented telephone conversation.
7. A regular letter or an unanswered telephone call is not an adequate "good faith" effort. A list of all Subcontractors, including the bidders not selected and non DBE Subcontractors, and bid amount for each item of the Work shall be submitted on Form 5. If a low bid was not accepted, an explanation shall be provided.
8. See "DBE Potential Resources Centers" Section in a later part these specifications.

12. DBE POTENTIAL RESOURCES CENTERS:

- 12.1. Utilization of SBA and 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 1. Solicitation shall be as broad as possible. The following web sites include a list of available sources for expanding the search for eligible DBEs:
 - 1. <http://www.sba.gov>
 - 2. <http://www.ccr.gov>
 - 3. <http://www.mbda.gov>
- 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 5. 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	PRO-Net Database: http://www.ccr.gov/ ¹
San Francisco, CA 94105	Bid Notification: http://web.sba.gov/subnet/ ²
RE: Minority Enterprise Development Offices	
U.S. Department of Commerce	(415) 744-3001

Name and Address	Telephone and Web Site
Minority Business Development Agency	Phoenix/ Opportunity Database:
211 Main Street, Room 1280	http://www.mbda.gov 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	www.dot.ca.gov/hq/bep
CA Public Utilities Commission (CPUC) ⁵	
505 Van Ness Avenue	http://www.cpuc.ca.gov/static/supplierdiversity
San Francisco, CA 94102-3298	

Notes:

1. PRO-Net new database is the SBA's electronic search engine that was put on line January 1, 2004, containing business profiles for nearly 200,000 businesses. The SBA requests Internet contact only for a list of potential DBE subcontractors that can be downloaded from PRO-Net: <http://www.ccr.gov>. Downloading will verify that the prime contractor made the required contact with the SBA. Provide 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-15-6231-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. VOLUME 1 FORMS** - The following CWSRF forms in Volume 1 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. EPA FORM 6100-2: DBE Subcontractor Participation Form
2. EPA Form 5700-52A: MBE/WBE Utilization Forms
3. Form AA61: List of Work Made Available
4. CWSRF Form 1: Good Faith Effort List of Subcontractors Solicited
5. CWSRF Form 2: Good Faith Effort Bids Received List
6. CWSRF Form 3: DBE/Contractor Certification
7. CWSRF Form 4: DBE Prime Contractor/Recipient Selected
8. CWSRF Form 5: Summary of Bids Received from Subcontractors, Suppliers and Brokers

- 14.1.2. VOLUME 2 FORMS** - See EPA forms 6100-2, 6100-3, and 6100-4 for additional required information to comply with EPA requirements. These forms are included in the Contract Documents or shall be obtained from: http://www.epa.gov/osbp/dbe_forms.htm. The following EPA forms in Volume 2 shall be completed and submitted with the Bid. Failure to

include any of the forms shall cause the Bid to be deemed **non-responsive**.

1. EPA FORM 6100-3: DBE Subcontractor Performance Form
2. EPA FORM 6100-4: DBE Subcontractor Utilization Form

FUNDING AGENCY PROVISIONS

FORMS



OMB Control No.: 2090-0030
 Approved: 08/13/2013
 Approval Expires: 08/31/2015

**Disadvantaged Business Enterprise (DBE) Program
 DBE Subcontractor Participation Form**

An EPA Financial Assistance Agreement Recipient must require its prime contractors to provide this form to its DBE subcontractors. This form gives a DBE¹ subcontractor² the opportunity to describe work received and/or report any concerns regarding the EPA-funded project (e.g., in areas such as termination by prime contractor, late payments, etc.). The DBE subcontractor can, as option, complete and submit this form to the EPA DBE Coordinator at any time during the project period of performance.

Subcontractor Name		Project Name	
Bid / Proposal No.	Assistance Agreement ID No. (if known)	Point of Contact	
Address			
Telephone No.		Email Address	
Prime Contractor Name		Issuing/Funding Entity:	

Contract Item Number	Description of Work Received from the Prime Contractor Involving Construction, Services, Equipment or Supplies	Amount Received by Prime Contractor

¹ A DBE is a Disadvantage, Minority, or Woman Business Enterprise that has been certified by an entity from which EPA accepts certifications as described in 40 CFR 33.204-33.205 or certified by EPA. EPA accepts certifications from entities that meet or exceed EPA certification standards as described in 40 CFR 33.202.

² Subcontractor is defined as a company, firm, joint venture, or individual who enters into an agreement with a contractor to provide services pursuant to an EPA award of financial assistance.

EPA FORM 6100-2 (DBE Subcontractor Participation Form)

**U.S. ENVIRONMENTAL PROTECTION AGENCY
 MBE/WBE UTILIZATION UNDER FEDERAL GRANTS
 AND COOPERATIVE AGREEMENTS**

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

1A. FEDERAL FISCAL YEAR (Oct. 1-Sep 30), _____		1B. REPORTING PERIOD (Check ALL appropriate boxes) <input type="checkbox"/> 1 st (Oct-Dec) <input type="checkbox"/> 2 nd (Jan-Mar) <input type="checkbox"/> 3 rd (Apr-Jun) <input type="checkbox"/> 4 th (Jul-Sep) <input type="checkbox"/> <input type="checkbox"/> Semi-Annual (Oct-Mar) <input type="checkbox"/> Semi-Annual (Apr-Sep) <input type="checkbox"/> Annual <input type="checkbox"/> Check if this is the last report for the project (Project completed).																					
1C. REVISION OF A PRIOR REPORT? <input type="checkbox"/> Yes <input type="checkbox"/> No Year: _____ Quarter: _____		BRIEFLY DESCRIBE THE REVISIONS YOU ARE MAKING:																					
2A. EPA FINANCIAL ASSISTANCE OFFICE ADDRESS (ATTN: DBE Coordinator):			3A. RECIPIENT NAME AND ADDRESS																				
2B. EPA DBE COORDINATOR Name: E-mail:		2C. PHONE: Fax:	3B. RECIPIENT REPORTING CONTACT: Name: E-mail:		3C. PHONE: Fax:																		
4A. FINANCIAL ASSISTANCE AGREEMENT ID NUMBER (SRF State Recipients, refer to Instructions for Completion of blocks 4A, 5A and 5C.)			4B. FEDERAL FINANCIAL ASSISTANCE PROGRAM TITLE or CFDA NUMBER:																				
5A. TOTAL ASSISTANCE AGREEMENT AMOUNT (SRF State Recipients, refer to Instructions for Completion of blocks 4A, 5A and 5C.) EPA Share: \$ _____ Recipient Share: \$ _____		5B. If NO procurement and NO accomplishments were made this reporting period (by the recipients, sub-recipients, loan recipients, and prime contractors), 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. <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>																					
5C. Total Procurements This Reporting Period (Only include amount not reported in any prior reporting period) Total Procurement Amount \$ _____ (Include total dollar values awarded by recipient, sub-recipients and SRF loan recipients, including MBE/WBE expenditures .)																							
5D. Were sub-awards issued under this assistance agreement? Yes <input type="checkbox"/> No <input type="checkbox"/> Were contracts issued under this assistance agreement? Yes <input type="checkbox"/> No <input type="checkbox"/>																							
5E. MBE/WBE Accomplishments This Reporting Period Actual MBE/WBE Procurement Accomplished: (Include total dollar values awarded by recipient, sub-recipients, SRF loan recipients and Prime Contractors.) <table style="width:100%; border-collapse: collapse; margin-top: 10px;"> <thead> <tr> <th style="width:15%;"></th> <th style="width:15%; text-align: center;"><u>Construction</u></th> <th style="width:15%; text-align: center;"><u>Equipment</u></th> <th style="width:15%; text-align: center;"><u>Services</u></th> <th style="width:15%; text-align: center;"><u>Supplies</u></th> <th style="width:15%; text-align: center;"><u>Total</u></th> </tr> </thead> <tbody> <tr> <td>SMBE:</td> <td>_____</td> <td>_____</td> <td>_____</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>SWBE:</td> <td>_____</td> <td>_____</td> <td>_____</td> <td>_____</td> <td>_____</td> </tr> </tbody> </table>							<u>Construction</u>	<u>Equipment</u>	<u>Services</u>	<u>Supplies</u>	<u>Total</u>	SMBE:	_____	_____	_____	_____	_____	SWBE:	_____	_____	_____	_____	_____
	<u>Construction</u>	<u>Equipment</u>	<u>Services</u>	<u>Supplies</u>	<u>Total</u>																		
SMBE:	_____	_____	_____	_____	_____																		
SWBE:	_____	_____	_____	_____	_____																		
6. 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																			

EPA FORM 5700-52A available electronically at http://www.epa.gov/osbp/pdfs/5700_52a.pdf

PART II.

MBE/WBE PROCUREMENTS MADE DURING REPORTING PERIOD
EPA Financial Assistance Agreement Number: _____

1. Procurement Made By			2. Business Enterprise		3. \$ Value of Procurement	4. Date of Procurement MM/DD/YY	5. Type of Product or ServicesA (Enter Code)	6. Name/Address/Phone Number of MBE/WBE Contractor or Vendor
Recipient	Sub-Recipient and/or SRF Loan Recipient	Prime	Minority	Women				

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.

EPA FORM 5700-52A - (Approval Expires 12/22/13)

Instructions:

A. General Instructions:

MBE/WBE utilization is based on 40 CFR Part 33. EPA Form 5700-52A must be completed by recipients of Federal grants, cooperative agreements, or other Federal financial assistance which involve procurement of supplies, equipment, construction or services to accomplish Federal assistance programs.

Recipients are required to report 30 days after the end of each federal fiscal quarter, semiannually, or annually, per the terms and conditions of the financial assistance agreement.

	Quarterly Reporting Due Date	Semiannual Reporting Due Date	Annual Reporting Due Date
Agreements awarded prior to May 27, 2008	January 30, April 30, July 30, October 30	N/A	October 30
Agreements awarded on or after May 27, 2008	N/A	April 30, October 30	October 30

MBE/WBE program requirements, including reporting, are material terms and conditions of the financial assistance agreement.

B. Definitions:

Procurement is the acquisition through contract, order, purchase, lease or barter of supplies, equipment, construction or services needed to accomplish Federal assistance programs.

A **contract** is a written agreement between an EPA recipient and another party (also considered “prime contracts”) and any lower tier agreement (also considered “subcontracts”) for equipment, services, supplies, or construction necessary to complete the project. This definition excludes written agreements with another public agency. This definition includes personal and professional services, agreements with consultants, and purchase orders.

A **minority business enterprise (MBE)** is a business concern that is (1) at least 51 percent owned 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. In order to qualify and participate as an MBE prime or subcontractor for EPA recipients under EPA’s DBE Program, an entity must be properly certified as required by 40 CFR Part 33, Subpart B.

U.S. citizenship is required. Recipients shall presume that minority individuals include Black Americans, Hispanic Americans, Native Americans, Asian Pacific Americans, or other groups whose members are found to be disadvantaged by the Small Business Act or by the Secretary of Commerce under section 5 of Executive order 11625. The reporting contact at EPA can provide additional information.

A **woman business enterprise (WBE)** is a business concern 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. In order to qualify and participate as a WBE prime or subcontractor for EPA recipients under EPA’s DBE Program, an entity must be properly certified as required by 40 CFR Part 33, Subpart B.

Business firms which are 51 percent owned by minorities or women, but are in fact managed and operated by non-minority individuals do not qualify for meeting MBE/WBE procurement goals. U.S. Citizenship is required.

Good Faith Efforts

A recipient is required to make the following Good Faith Effort whenever procuring construction, equipment, services, and supplies under an EPA financial assistance agreement. These Good Faith Effort for utilizing MBEs and WBEs must be documented. Such documentation is subject to EPA review upon request:

1. Include of MBEs/WBEs on solicitation lists.

2. Assure that MBEs/WBEs are solicited once they are identified.
3. Divide total requirements into smaller tasks to permit maximum MBE/WBE participation, where feasible.
4. Establish delivery schedules which will encourage MBE/WBE participation, where feasible.
5. Encourage use of the services of the U.S. Department of Commerce's Minority Business Development Agency (MBDA) and the U.S. Small Business Administration to identify MBEs/WBEs.
6. Require that each party to a subgrant, subagreement, or contract award take the Good Faith Effort outlined here.

C. Instructions for Part I:

- 1a. Specify Federal fiscal year this report covers. The Federal fiscal year runs from October 1st through September 30th (e.g. **November 29, 2010 falls within Federal fiscal year 2011**)
- 1b. Check applicable reporting box, quarterly, semiannually, or annually. Also indicate if this is the last report for the project.
- 1c. Indicate if this is a revision to a previous year, half-year, or quarter, and provide a brief description of the revision you are making.
- 2a-c. Please refer to your financial assistance agreement for the mailing address of the EPA financial assistance office for your agreement.

The "EPA DBE Reporting Contact" is the DBE Coordinator for the EPA Region from which your financial assistance agreement was originated. For a list of DBE Coordinators please refer to the EPA OSBP website at www.epa.gov/osbp. Click on "Regional Contacts" for the name of your coordinator.

3a-c. Identify the agency, state authority, university or other organization which is the recipient of the Federal financial assistance and the person to contact concerning this report.

4a. Provide the Assistance Agreement number assigned by EPA. A separate report must be submitted for each Assistance Agreement.

***For SRF recipients:** In box 4a list numbers for ALL OPEN Assistance Agreements being reported on this form. Please note that although the New DBE Rule (which took effect May 27, 2008) revised the reporting frequency requirements from quarterly to semiannually, that change only applies to agreements awarded AFTER the New DBE Rule took effect. Therefore, SRF recipients may either continue to report activity for all Agreements on one form on a quarterly basis until the last award that was made prior to the New DBE Rule has been closed out; OR, the recipient may split the submission of SRF reports into quarterly reports for Agreements awarded prior the New DBE Rule, and semiannually for the awards made after the New DBE Rule.

4b. Refer back to Assistance Agreement document for this information.

5a. Provide the total amount of the Assistance Agreement which includes Federal funds plus recipient matching funds and funds from other sources.

***For SRF recipients only:** SRF recipients will not enter an amount in 5a. Please leave 5a blank.

5b. Self-explanatory.

5c. Provide the total dollar amount of ALL procurements awarded this reporting period by the recipient, sub-recipients, and SRF loan recipients, **including** MBE/WBE expenditures. For example: Actual dollars for procurement from the procuring office; actual contracts let from the contracts office; actual goods, services, supplies, etc., from

other sources including the central purchasing/ procurement centers).

***NOTE:** To prevent double counting on line 5C, if any amount on 5E is for a subcontract and the prime contract has already been included on Line 5C in a prior reporting period, then report the amount going to MBE or WBE subcontractor on line 5E, but exclude the amount from Line 5C. To include the amount on 5C again would result in double counting because the prime contract, which includes the subcontract, would have already been reported.

5d. State whether or not sub-awards and/or subcontracts have been issued under the assistance agreement by indicating “yes” or “no”.

5e. Where requested, also provide the total dollar amount of all MBE/WBE procurement awarded during this reporting period by the recipient, sub-recipients, SRF loan recipients, and prime contractors in the categories of construction, equipment, services and supplies. These amounts include Federal funds plus recipient matching funds and funds from other sources.

***For SRF recipients only:** In 5c please enter the total procurement amount for the quarter, or semiannual period, under all of your SRF Assistance Agreements. The figure reported in this section is **not** directly tied to an individual Assistance Agreement identification number. **(SRF state recipients report state procurements in this section)**

6. If there were no MBE/WBE accomplishments this reporting period, please briefly explain what specific steps you are taking to achieve the MBE/WBE requirements specified in the terms and conditions of the Assistance Agreement.

7. Name and title of official administrator or designated reporting official.

8. Signature, month, day, and year report submitted.

D. Instructions for Part II:

For each MBE/WBE procurement made under this assistance agreement during the reporting period, provide the following information:

1. Check whether this procurement was made by the recipient, sub-recipient/SRF loan recipient, or the prime contractor.
2. Check either the MBE or WBE column. If a firm is both an MBE and WBE, the recipient may choose to count the entire procurement towards EITHER its MBE or WBE accomplishments. The recipient may also divide the total amount of the procurement (using any ratio it so chooses) and count those divided amounts toward its MBE and WBE accomplishments. If the recipient chooses to divide the procurement amount and count portions toward its MBE and WBE accomplishments, please state the appropriate amounts under the MBE and WBE columns on the form. **The combined MBE and WBE amounts for that MBE/WBE contractor must not exceed the “Value of the Procurement” reported in column #3**
3. Dollar value of procurement.
4. Date of procurement, shown as month, day, year. Date of procurement is defined as the date the contract or procurement was awarded, **not** the date the contractor received payment under the awarded contract or procurement, unless payment occurred on the date of award. **(Where direct purchasing is the procurement method, the date of procurement is the date the purchase was made)**
5. Using codes at the bottom of the form, identify type of product or service acquired through this procurement (e.g., enter 1 if construction, 2 if supplies, etc).
6. Name, address, and telephone number of MBE/WBE firm.

**This data is requested to comply with provisions mandated by: statute or regulations (40 CFR Part 30, 31, and 33); OMB Circulars; or added by EPA to ensure sound and effective assistance management. Accurate, complete data are required to obtain funding, while no pledge of confidentiality is provided.

The public reporting and recording burden for this collection of information is estimated to average 1 hour per response annually. Burden means the total time, effort, or financial resources expended by persons to generate, maintain, retain, or disclosure or provide information to or for a Federal agency. This includes the time needed to review instructions; develop, acquire, install, and utilize technology and systems for the purposes of collecting, validating, and verifying information, processing and maintaining information, and disclosing and providing information; adjust the existing ways to comply with any previously applicable instructions and requirements; train personnel to be able to respond to a collection of information; search data sources; complete and review the collection of information; and transmit or otherwise disclose the information. An agency may not conduct or sponsor, and a person is not required to respond to, a collection of information unless it displays a currently valid OMB control number.

Send comments on the Agency's need for this information, the accuracy of the provided burden estimates, and any suggested methods for minimizing respondent burden, including through the use of automated collection techniques to the Director, OPPE Regulatory Information Division, U.S. Environmental Protection Agency (2136), 1200 Pennsylvania Avenue, NW, Washington, D.C. 20460. Include the OMB Control number in any correspondence. Do not send the completed form to this address.

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

Clean Water State Revolving Fund Loan Program DBE Instructions

FORM 3

DISADVANTAGE BUSINESS ENTERPRISE (DBE)

CONTRACTOR CERTIFICATION

Firm Name:		Phone:	
Address:			
Principal Service or Product:	Bid Amount \$		
PLEASE INDICATE PERCENTAGE OF OWNERSHIP			
<input type="checkbox"/> DBE _____% Ownership			
<input type="checkbox"/> Prime Contractor		<input type="checkbox"/> Supplier of Material/Service	
<input type="checkbox"/> Subcontractor		<input type="checkbox"/> Broker	
<input type="checkbox"/> Sole Ownership		<input type="checkbox"/> Corporation	
<input type="checkbox"/> Partnership		<input type="checkbox"/> Joint Venture	
Certified by:		Title:	
DBE Sub (ORIGINAL SIGNATURE AND DATE REQUIRED)			
Name:		Date:	

IMPORTANT: CONTRACTORS CAN NO LONGER SELF-CERTIFY. THEY MUST BE CERTIFIED BY EPA, SMALL BUSINESS ADMINISTRATION (SBA), DEPARTMENT OF TRANSPORTATION (DOT) OR BY STATE, LOCAL, TRIBAL OR PRIVATE ENTITIES WHOSE CERTIFICATION CRITERIA MATCH EPA'S. PROOF OF CERTIFICATION MUST BE PROVIDED. A COPY OF THE CONTRACTOR CERTIFICATION MUST BE SUBMITTED WITH THIS FORM.

THIS FORM MUST BE SUBMITTED WITHIN 4 WORKING DAYS AFTER THE BID OPENING DATE.

January 2009

**Clean Water State Revolving Fund Loan Program DBE Instructions
FORM 4 (Attachment B)**

PRIME CONTRACTOR/RECIPIENT

SELECTED DISADVANTAGE BUSINESS ENTERPRISE (DBE)

CONTRACT RECIPIENTS NAME:		CONTRACT NO. OR SPECIFICATION NO.:	
PROJECT DESCRIPTION:		PROJECT LOCATION:	
PRIME CONTRACTOR INFORMATION			
NAME AND ADDRESS (Include Zip Code, Federal Employer Tax ID #):		AMOUNT OF CONTRACT \$	
PHONE:			
DBE INFORMATION			
<input type="checkbox"/> <input type="checkbox"/> NONE*		NAME AND ADDRESS (INCLUDE ZIP CODE)	
<input type="checkbox"/> <input type="checkbox"/> DBE			
<input type="checkbox"/> <input type="checkbox"/> SUBCONTRACTOR	<input type="checkbox"/> <input type="checkbox"/> SUPPLIER/SERVICE		
<input type="checkbox"/> <input type="checkbox"/> JOINT VENTURE	<input type="checkbox"/> <input type="checkbox"/> BROKER		
AMOUNT OF CONTRACT \$		PHONE:	
WORK TO BE PERFORMED			
<input type="checkbox"/> <input type="checkbox"/> DBE		NAME AND ADDRESS (INCLUDE ZIP CODE)	
<input type="checkbox"/> <input type="checkbox"/> SUBCONTRACTOR	<input type="checkbox"/> <input type="checkbox"/> SUPPLIER/SERVICE		
<input type="checkbox"/> <input type="checkbox"/> JOINT VENTURE	<input type="checkbox"/> <input type="checkbox"/> BROKER		
AMOUNT OF CONTRACT \$			
PHONE:			
WORK TO BE PERFORMED			
<input type="checkbox"/> <input type="checkbox"/> DBE		NAME AND ADDRESS (INCLUDE ZIP CODE)	
<input type="checkbox"/> <input type="checkbox"/> SUBCONTRACTOR	<input type="checkbox"/> <input type="checkbox"/> SUPPLIER/SERVICE		
<input type="checkbox"/> <input type="checkbox"/> JOINT VENTURE	<input type="checkbox"/> <input type="checkbox"/> BROKER		
AMOUNT OF CONTRACT \$			
PHONE:			
WORK TO BE PERFORMED			
TOTAL DBE AMOUNT: \$ _____			
SIGNATURE OF PERSON COMPLETING FORM: _____			
TITLE: _____		PHONE: _____	DATE: _____

***Negative reports are required. ORIGINAL SIGNATURE AND DATE REQUIRED. Failure to complete and submit this form within 4 Working Days of bid opening will cause bid to be rejected as non-responsive.**

January 2009

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 are 6:30 AM to 3:30 PM.

SECTION 2 - SCOPE AND CONTROL OF WORK

2-3.2 Self Performance. DELETE in its entirety and SUBSTITUTE with the following:

1. You must perform, with your own organization, Contract work amounting to at least 50% of the base bid alone or base bid and any additive or deductive alternate(s) that together when added or deducted form the basis of award.
2. The self performance percentage requirement will be waived for contracts when a “B” License is required or allowed.

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>

SECTION 4 - CONTROL OF MATERIALS

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

No special inspection shall be paid for or performed by the Contractor. The City shall employ and pay for the services of qualified inspection entities to perform specialty inspection services.

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 must submit your list of proposed substitutions for "an equal" ("or equal") item(s) **no less than 15 Working Days prior to Bid due date** and on the City's Product Submittal Form available at.

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

SECTION 7 - RESPONSIBILITIES OF THE CONTRACTOR

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

The insurance provisions herein must 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 must 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. Payment for insurance is included in the various items of Work as bid by you, and 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 must 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 must 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 must 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 must be no endorsement or modification limiting the scope of coverage for either "insured vs. insured" claims or contractual liability. You must maintain the same or equivalent insurance for at least 10 years following completion of the Work.
4. All costs of defense must be outside the policy limits. Policy coverage must be in liability limits of not less than the following:

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

7-3.2.2 Commercial Automobile Liability Insurance.

1. You must 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 must be outside the limits of the policy.

7-3.2.3 Contractors Pollution Liability Insurance.

1. You must procure and maintain at your expense or require 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 must be outside the limits of the policy. Any such insurance provided by Subcontractor instead of you must be approved separately in writing by the City.
3. For approval of a substitution of Subcontractor’s insurance, you must 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 must not exceed \$25,000 per claim.
4. Contractual liability must include coverage of tort liability of another party to pay for bodily injury or property damage to a third person or organization. There must 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 must be procured before the Work commences and must be maintained for the Contract Time. Claims Made policies must be procured before the Work commences, must be maintained for the Contract Time, and must include a 12 month extended Claims Discovery Period applicable to this contract or the existing policy or policies must 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 must provide that the City is entitled to 30 days prior written notice (10 days for cancellation due to non-payment of premium) of cancellation or non-renewal of the policy or policies.

7-3.2.5 Contractors Builders Risk Property Insurance..

1. You must provide at its expense, and maintain until Final Acceptance of the Work, a Special Form Builders Risk Policy or Policies. This insurance must 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 must 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 must include material or portions of the Work located away from the Site but intended for use at the Site, and must cover material or portions of the Work in transit. The policy or policies must include as insured property scaffolding, falsework, and temporary buildings located at the Site. The policy or policies must cover the cost of removing debris, including demolition.
3. The policy or policies must provide that all proceeds thereunder must be payable to the City as Trustee for the insured, and must name the City, the Contractor, Subcontractors, and Suppliers of all tiers as named insured. We 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 must 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 must 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 must 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 must be entitled to 100% of its loss. The Contractor must 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 must be responsible for 100% of the loss not insured because of the deductible. Except as provided for under California law, the policy or policies must 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 must 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 must 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 must 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.

- a) You must 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.
- b) To the fullest extent allowed by law e.g., California Insurance Code §11580.04, the policy must be endorsed to include the City and its respective elected officials, officers, employees, agents, and representatives as additional insured.
- c) The additional insured coverage for projects for which the Engineer's Estimate is \$1,000,000 or more must 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.
- d) The additional insured coverage for projects for which the Engineer's Estimate is less than \$1,000,000 must 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 must 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 must provide that any insurance maintained by the City and its elected officials, officers, employees, agents and representatives must be in excess of your insurance and must not contribute to it.

7-3.5.1.3 Project General Aggregate Limit.

The policy or policies must 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 must reduce the Designated Construction Project General Aggregate Limit. The Designated Construction Project General Aggregate Limit must 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 must be endorsed to include the City and its respective elected officials, officers, employees, agents, and representatives as additional insured, with respect to liability arising out of automobiles owned, leased, hired or borrowed by you or on your behalf. This endorsement is limited to the obligations permitted by California Insurance Code §11580.04.

7-3.5.3 Contractors Pollution Liability Insurance Endorsements.

7-3.5.3.1 Additional Insured.

- a) The policy or policies must 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 must 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.
- b) 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 is 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 must 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 must 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 must be in excess of your insurance and must not contribute to it.

7-3.5.3.3 Severability of Interest. For Contractors Pollution Liability Insurance, the policy or policies must provide that your insurance must 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 must provide cross-liability coverage.

7-3.5.5 Builders Risk Endorsements.

7-3.5.5.1 Waiver of Subrogation. The policy or policies must 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 Builders Risk – Partial Utilization. If the City desire 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 must immediately notify your Builder's Risk insurer and obtain an endorsement that the policy or policies must not be cancelled or lapse on account of any such partial use or occupancy. You must obtain the endorsement prior to our occupation and use.

7-3.6 Deductibles and Self-Insured Retentions. You must pay for all deductibles and self-insured retentions. You must 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 must 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 must 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 must 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 must be not less than the following:

<u>Workers' Compensation</u>	<u>Statutory Employers Liability</u>
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 require 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 must 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 must 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.

7-5.3 Payment. To The City Supplement, ADD the following:

The Permits, Fees and Notices – Type I allocation specified in the Proposal (Bid) form and as determined by the Owner, shall be paid for as a reimbursable for the exact amount of the permit, fee and notice procured by the Contractor and shall be utilized for procuring Development Service Department (DSD) permits required for the construction of the project, including providing all labor, materials, and incidentals required for procuring the permits, fees and notices, complete and in kind as required by the contract drawings, Greenbook, Whitebook, Special Provisions, Supplementary Special Provisions and Technical Specifications.

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 3/4".

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 will work with the Contractor to inform the public (which includes, but is not limited to, property owners, renters, homeowners, business owners, recreational users, and other community members and stakeholders) of construction impacts. Efforts by the Contractor to mitigate construction impacts by communicating with the public require close coordination and cooperation with the City.

2. The Contractor will perform the community outreach activities required throughout the Contract Time.
3. The Contractor shall closely coordinate the Work with the businesses, institutions, residents and property owners impacted by the Project. Example duties of the Contractor include notification to the businesses, institutions and residents of the commencement of construction activities not less than 5 days in advance, coordination of access for vehicular and pedestrian traffic to businesses, institutions and residences impacted by the Project, reporting of Contractor activities at all Project progress meetings scheduled by the Engineer, attendance to the Project Pre-construction Meeting, attendance at 2 community meetings, response to community questions and complaints related to Contractor activities, and written documentation including logging in all inquiries and complaints received into the City's Public Contact Log located on the City's SDSShare site:

<http://sdshare/forums/ecp/PITS/picr/Lists/Public%20Contact%20Log/AllItems.aspx>

4. The Contractor shall execute the Information Security Policy Acknowledgement Form - For Non-City Employees within 15 days of the award of the Contract if:
 - a) The contact information for the Contractor is made available on any outreach materials or;
 - b) The Contractor will be the primary point of contact to resolve project related inquiries and complaints.
5. Electronic Communication.

All inquiries and complaints will be logged in to the City's SDSShare site within 24 hours of receipt of inquiries and complaints.

Any updates or a resolution of inquiries, and complaints shall be documented in the City's SDSShare site within 24 hours.

Copies of email communications shall be saved on to the City's SDSShare site as individually as an Outlook Message Format (*.msg).

All graphics, photos, and other electronic files associated with the inquiries and or complaints shall be saved into the individual record.

6. **When specified**, present your Exclusive Community Liaison to the Engineer, in writing, within 15 days of the award of the Contract.

7-16.2 Submittals.

1. The Contractor 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, the Contractor 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.
 - b. After distributing or mailing, the Contractor shall submit verification of delivery and any copies of returned notices to the Resident Engineer.
2. The Contractor will use the City's SDSshare site to identify and summarize communications (via phone, in person, and email) with the public the within 24 hours of receipt, even if the Contractor's response to the individual is still incomplete. The Contractor will upload to the City's SDSshare site copies of all written, electronic, and verbal communications and conversations with the public.

7-16.3 Public Notice by Contractor.

1. 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 where Work is to be performed at least 5 days before starting the Work as directed by the Resident Engineer.
2. 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.

7-16.4 Quality Assurance.

1. During the course of community outreach, the Contractor shall ensure the character of all persons that conduct community outreach (distributing door hangers, attending community meetings, interacting with the public, etc.), on behalf of the Contractor:
 - 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 an employee of the Contractor,
 - c. Have the interpersonal skills to effectively, professionally, and tactfully represent the project, Contractor, and City to the public.

7-16.5 Communications with the Public.

1. The Contractor shall provide updates on construction impacts to the Resident Engineer. The Contractor 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.
2. The Contractor 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.
3. At the request of the Resident Engineer, the Contractor shall attend and participate in project briefings at community meetings.
4. The Contractor shall coordinate with the Resident Engineer on all responses and actions taken to address public inquiries and complaints within 24-hours that they are received.

7-16.6 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, members of the media may show up at construction sites, uninvited. Members of the media (including, but not limited to newspaper, magazine, radio, 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 media representatives arrive near or on the construction site(s), the Contractor 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. The Contractor shall report all members of the media visits 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, the Contractor shall allow the City to escort the media representatives while they are on the construction site and shall ensure their safety.
6. The Contractor shall require media representatives to sign in and out of the Site Visitor Log and to use Personal Protective Equipment.
7. The Contractor has a right to speak to members of the media about its company and its role on the project. All other questions shall be referred to the City.

7-16.7 Exclusive Community Liaison Services.

If directed to conduct Exclusive Community Liaison Services, the Contractor shall

retain an Exclusive Community Liaison for the Project whose sole responsibilities will be as follows:

1. Develop a contact list of community, tenants, property owners, and agencies with a stake in the project.
2. Notify businesses, institutions, property owners, and residents of the commencement of construction activities and utility service interruptions not less than 5 days in advance.
3. Coordinate access for vehicular and pedestrian traffic to businesses, institutions and residences impacted by the Project.
4. Prepare and present of materials in coordination with the Resident Engineer (the City's standards and guidelines for the communication materials are available for review by Bidders by sending a request to the Contract Specialist).
5. Respond to community questions and complaints related to Contractor activities.
6. Write, edit, update, or produce brochures, pamphlets and news releases.
7. 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 the City's SDSshare site.
8. Report Exclusive Community Liaison activities at all progress meetings scheduled by the Resident Engineer.
9. Attendance at pre-construction, community and stakeholders meetings.

7-16.7.1 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) **as specified** within 15 days of the Award of the Contract.

7-16.8 Payment. The Payment for the community outreach and public notices is included in the various Bid items. The payment for exclusive community liaison is in the bid item for "Exclusive Community Liaison Services."

7-20 ELECTRONIC COMMUNICATION. ADD the following:

Virtual Project Manager will be used on this contract.

SECTION 9 - MEASUREMENT AND PAYMENT

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."

9-3.4.1 Payment. To the City Supplement, ADD the following:

3. The contract lump sum price paid for "Mobilization" shall include full compensation for providing all labor, materials, supplies, tools, equipment and incidentals required for mobilizing and demobilizing for the project, complete and in place, including but not limited to furnishing and installing staging and storage, submittals, schedules, temporary offices, temporary facilities, and all work required and involved in mobilization and demobilization as shown on the drawings and specified in the Greenbook, Whitebook, Special Provisions, Supplementary Special Provisions and Technical Specifications.

9-3.5 Field Orders. To the City Supplement, ADD the following:

The Field Orders – Type II allowance items specified in the Proposal (Bid) form and as determined by the Owner, shall be utilized for approved field orders, including providing all labor, materials, tools, equipment, and incidentals required for furnishing and installing field order items of Work that are determined during construction, complete and in kind as required by the contract drawings, Greenbook, Whitebook, Special Provisions, Supplementary Special Provisions and Technical Specifications.

ADD:

9-3.8 Pay Items. The Pay Items listed below refer to and are the same Pay Items listed in the Proposal (Bid) form of the Bidding Documents. The items below constitute all of the pay items for the completion of the WORK.

Area 60 Tank Farm Structural Work

The contract lump sum price paid for "Area 60 Tank Farm Structural Work" includes full compensation for providing all labor, materials, supplies, tools, equipment and incidentals required for furnishing and installing the Area 60 tank farm access platforms and roof panel structural improvements, complete and in place, including but not limited to access platform gating, structural members, platform supports, hardware, anchors, railings and chains, ladders, steps, grout, modification to existing platforms and railings, platform signage, roof panel connection tabs, roof hardware, welding, roof signage, modification to existing roof panels, structural coatings and paint, structural demolition, testing, special inspection, and appurtenances. All WORK shall be complete, in place and operable, in accordance with the requirements of the Contract Documents, as shown on the drawings, as specified in the Greenbook,

Whitebook, Special Provisions, Supplementary Special Provisions and Technical Specifications.

Containment Area Protective Coating Work (All Areas)

The contract lump sum price paid for “Containment Area Protective Coating Work (All Areas)” includes full compensation for providing all labor, materials, supplies, tools, equipment and incidentals required for cleaning existing residues to expose existing coatings, removal of existing coatings, preparation of surfaces for new coatings including concrete repairs, repairing damaged coatings and applying all new protective coating systems for Areas 60, 77 and 80. All WORK shall be complete, in place and operable, in accordance with the requirements of the Contract Documents, as shown on the drawings, as specified in the Greenbook, Whitebook, Special Provisions, Supplementary Special Provisions and Technical Specifications.

All Work Associated With Chemical System Improvements – Area 60 (Polymer Mixing)

The contract lump sum price paid for “All Work Associated With Chemical System Improvements – Area 60 (Polymer Mixing)” includes full compensation for providing all labor, materials, supplies, tools, equipment and incidentals required for furnishing and installing the polymer mixing chemical system improvements within Area 60, complete and in place, including but not limited to piping, connections, couplings, fittings, quick connections, pipe and equipment supports, wall penetrations, valves, valve actuators, valve operator extensions, polymer mixing pump, concrete pump pad, grating modifications, electrical improvements, conduits, conductors, instruments, control equipment, electrical and control equipment relocations, DCS modification coordination, system coordination, system startups and shutdowns, temporary systems, equipment and system testing, appurtenances, demolition and removals of existing polymer mixing equipment, training, and O&M manual preparation. All WORK shall be complete, in place and operable, in accordance with the requirements of the Contract Documents, as shown on the drawings, as specified in the Greenbook, Whitebook, Special Provisions, Supplementary Special Provisions and Technical Specifications.

All Work Associated With Chemical System Improvements - Area 60 (Polymer Bulk Storage)

The contract lump sum price paid for “All Work Associated With Chemical System Improvements – Area 60 (Polymer Bulk Storage)” includes full compensation for providing all labor, materials, supplies, tools, equipment and incidentals required for furnishing and installing the polymer bulk storage chemical system improvements within Area 60, complete and in place, including but not limited to piping, connections, couplings, fittings, quick connections, pipe and equipment supports, wall penetrations, valves, valve actuators, valve operator extensions, grating modifications, electrical improvements, conduits, conductors, instruments, control equipment, electrical and control equipment relocations, DCS modification coordination, system coordination, system startups and shutdowns, temporary systems, equipment and system testing, appurtenances, demolition and removals of existing polymer equipment, training, and O&M manual preparation. All WORK shall be complete, in place and operable, in accordance with the requirements of the

Contract Documents, as shown on the drawings, as specified in the Greenbook, Whitebook, Special Provisions, Supplementary Special Provisions and Technical Specifications.

All Work Associated With Chemical System Improvements - Area 60 (Ferric Chloride)

The contract lump sum price paid for “All Work Associated With Chemical System Improvements – Area 60 (Ferric Chloride System)” includes full compensation for providing all labor, materials, supplies, tools, equipment and incidentals required for furnishing and installing the ferric chloride chemical system improvements within Area 60, complete and in place, including but not limited to piping, dual containment piping, connections, couplings, fittings, quick connections, pipe and equipment supports, wall penetrations, valves, valve actuators, valve operator extensions, limit switch operator extensions, leak detection systems, grating modifications, electrical improvements, conduits, conductors, instruments, control equipment, electrical and control equipment relocations, DCS modification coordination, system coordination, system startups and shutdowns, temporary systems, equipment and system testing, appurtenances, demolition and removals of existing piping and equipment, training, and O&M manual preparation. All WORK shall be complete, in place and operable, in accordance with the requirements of the Contract Documents, as shown on the drawings, as specified in the Greenbook, Whitebook, Special Provisions, Supplementary Special Provisions and Technical Specifications.

All Work Associated With Chemical System Improvements - Area 60 (Ferrous Chloride)

The contract lump sum price paid for “All Work Associated With Chemical System Improvements – Area 60 (Ferrous Chloride)” includes full compensation for providing all labor, materials, supplies, tools, equipment and incidentals required for furnishing and installing the ferrous chloride chemical system improvements within Area 60, complete and in place, including but not limited to piping, dual containment piping, connections, couplings, fittings, quick connections, pipe and equipment supports, wall penetrations, valves, valve actuators, valve operator extensions, limit switch operator extensions, leak detection systems, grating modifications, electrical improvements, conduits, conductors, instruments, control equipment, electrical and control equipment relocations, DCS modification coordination, system coordination, system startups and shutdowns, temporary systems, equipment and system testing, appurtenances, demolition and removals of existing polymer equipment, training, and O&M manual preparation. All WORK shall be complete, in place and operable, in accordance with the requirements of the Contract Documents, as shown on the drawings, as specified in the Greenbook, Whitebook, Special Provisions, Supplementary Special Provisions and Technical Specifications.

All Work Associated With Chemical System Improvements - Area 60 (Sulfuric Acid)

The contract lump sum price paid for “All Work Associated With Chemical System Improvements – Area 60 (Sulfuric Acid)” includes full compensation for providing all labor, materials, supplies, tools, equipment and incidentals required for furnishing and installing the sulfuric acid chemical system improvements within Area 60, complete and in place, including but not limited to piping, dual containment piping,

connections, couplings, fittings, quick connections, pipe and equipment supports, wall penetrations, valves, valve operator extensions, limit switches, limit switch operator extensions, grating modifications, electrical improvements, conduits, conductors, instruments, electrical and control equipment relocations, DCS modification coordination, system coordination, system startups and shutdowns, temporary systems, equipment and system testing, appurtenances, demolition and removals of existing piping and equipment, training, and O&M manual preparation. All WORK shall be complete, in place and operable, in accordance with the requirements of the Contract Documents, as shown on the drawings, as specified in the Greenbook, Whitebook, Special Provisions, Supplementary Special Provisions and Technical Specifications.

All Work Associated With Chemical System Improvements - Area 60 (Sodium Hypochlorite)

The contract lump sum price paid for “All Work Associated With Chemical System Improvements – Area 60 (Sodium Hypochlorite)” includes full compensation for providing all labor, materials, supplies, tools, equipment and incidentals required for furnishing and installing the sodium hypochlorite chemical system improvements within Area 60, complete and in place, including but not limited to piping, dual containment piping, connections, couplings, fittings, quick connections, pipe and equipment supports, wall penetrations, valves, valve operator extensions, limit switch operator extensions, grating modifications, electrical improvements, conduits, conductors, instruments, control equipment, electrical and control equipment relocations, DCS modification coordination, system coordination, system startups and shutdowns, temporary systems, equipment and system testing, appurtenances, demolition and removals of existing sodium hypochlorite piping, equipment and pumps, training, and O&M manual preparation. All WORK shall be complete, in place and operable, in accordance with the requirements of the Contract Documents, as shown on the drawings, as specified in the Greenbook, Whitebook, Special Provisions, Supplementary Special Provisions and Technical Specifications.

All Work Associated With Chemical System Improvements - Area 60 (Caustic Soda)

The contract lump sum price paid for “All Work Associated With Chemical System Improvements – Area 60 (Caustic Soda)” includes full compensation for providing all labor, materials, supplies, tools, equipment and incidentals required for furnishing and installing the caustic soda chemical system improvements within Area 60, complete and in place, including but not limited to piping, dual containment piping, connections, couplings, fittings, quick connections, pipe and equipment supports, wall penetrations, valves, valve operator extensions, limit switch operator extensions, grating modifications, electrical improvements, conduits, conductors, instruments, control equipment, electrical and control equipment relocations, DCS modification coordination, system coordination, system startups and shutdowns, temporary systems, equipment and system testing, appurtenances, demolition and removals of existing caustic soda piping and equipment, training, and O&M manual preparation. All WORK shall be complete, in place and operable, in accordance with the requirements of the Contract Documents, as shown on the drawings, as specified in the Greenbook, Whitebook, Special Provisions, Supplementary Special Provisions and Technical Specifications.

All Work Associated With Chemical System Improvements - Area 76 (Ferric Chloride and Polymer)

The contract lump sum price paid for “All Work Associated With Chemical System Improvements – Area 76 (Ferric Chloride and Polymer)” includes full compensation for providing all labor, materials, supplies, tools, equipment and incidentals required for furnishing and installing the ferric chloride and polymer dilution chemical system improvements within Area 76, including but not limited to piping, dual containment piping, connections, couplings, fittings, quick connections, pipe and equipment supports, wall penetrations, valves, leak detection systems, grating modifications, electrical improvements, conduits, conductors, instruments, control equipment, electrical and control equipment relocations, DCS modification coordination, system coordination, system startups and shutdowns, temporary systems, equipment and system testing, appurtenances, demolition and removals of existing systems piping, equipment and pumps, training, and O&M manual preparation. All WORK shall be complete, in place and operable, in accordance with the requirements of the Contract Documents, as shown on the drawings, as specified in the Greenbook, Whitebook, Special Provisions, Supplementary Special Provisions and Technical Specifications.

All Work Associated With Chemical System Improvements - Area 80 (Ferrous Chloride)

The contract lump sum price paid for “All Work Associated With Chemical System Improvements – Area 80 (Ferrous Chloride)” includes full compensation for providing all labor, materials, supplies, tools, equipment and incidentals required for furnishing and installing the ferrous chloride chemical system improvements within Area 80, including the digesters and pipe gallery, and ferric chloride chemical system improvements in the pipe gallery, including but not limited to piping, dual containment piping, connections, couplings, fittings, quick connections, pipe and equipment supports, wall penetrations, valves, valve actuators, valve operator extensions, chemical feed pumps, relocation of pumps, pump rack, flow meters, leak detection systems, grating modifications, electrical improvements, conduits, conductors, instruments, control equipment, electrical and control equipment relocations, DCS modification coordination, system coordination, system startups and shutdowns, temporary systems, equipment and system testing, appurtenances, demolition and removals of existing ferrous and ferric chloride piping, equipment and pumps, training, and O&M manual preparation. All WORK shall be complete, in place and operable, in accordance with the requirements of the Contract Documents, as shown on the drawings, as specified in the Greenbook, Whitebook, Special Provisions, Supplementary Special Provisions and Technical Specifications.

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.

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

PVC products as manufactured or distributed by J-M Manufacturing Company shall not be used on this Contract.

207-26.4 Butterfly Valves. Industrial Butterfly Valves shall be per supplemental submittal section 15092

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.

207-27 FUSIBLE NON-PRESSURE POLYVINYLCHLORIDE PIPE. DELETE in its entirety.

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

ADD:

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

- a) Trench marker tape shall be 6" wide and consist of a minimum 5.0 mil, five-ply 100% virgin polyethylene which is acid, alkaline and corrosion resistant. Elongation properties and tensile strength of not less than 7,800 psi shall be in accordance with ASTM D882-80A. The trench marker tape for water lines shall have a minimum 20 gauge solid aluminum foil core, adhered to a 2.55 mil polyethylene backing.
- b) Tape color and legend shall be placed beneath the top protective layer subject to the following:

1. Blue with “Caution Potable Water Line Buried Below” for Water mainlines and over pipe sleeves.
2. Purple with “Caution Recycled/Reclaimed Water Line Buried Below” for recycled water irrigation mainlines.
3. Red with “Caution Electric Line Buried Below” for electrical lines servicing the irrigation system, including, but not limited to, 110/220v power to irrigation controllers and pumps, communication cables and irrigation direct burial control wires to remote control valves.
4. Green with “Caution Sewer Line Buried Below” for Sewer mainlines and over pipe sleeves.

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 roadway resurfacing or the application of slurry, the Contractor shall complete all necessary preparation and repair work to the road segment e.g., tree trimming, weed spray, weed abatement, crack sealing, asphalt repair, hump removal, miscellaneous asphalt patching, removal of raised pavement markers, removal of pavement markings, etc. and as specified in the Special Provisions.
2. Preparatory work shall include, but not be limited to, tree trimming, weed spray, weed abatement, crack sealing, asphalt repair i.e., mill and pave, hump removal, miscellaneous asphalt patching, removal of raised pavement markers, removal of pavement markings, etc.
3. The Contractor shall repair areas of distressed asphalt concrete pavement by milling or removing damaged areas of pavement to a minimum depth of 2” for Residential streets, and a minimum depth of 3” for all others to expose firm and unyielding pavement. The Contractor shall prepare subgrade as needed and install a minimum of 2” for residential streets, and a minimum of 3” for all others, of compacted asphalt concrete pavement over compacted native material as directed by the Engineer.

4. If, in order to achieve the minimum specified depth, the base material is exposed, the material shall be compacted to 95% relative compaction to a depth 10" below the finished grade (dig out). Compaction tests shall be made to ensure compliance with the specifications. The Engineer will determine when and where the test will occur. The City will pay for the soils testing required by the Engineer, which meets the required compaction. The Contractor shall reimburse the City for the cost of retesting failing compaction tests. If additional base material is required, the Contractor shall use Class 2 Aggregate Base in accordance with 200-2.2, "Crushed Aggregate Base."
5. Recycled base material shall conform to Crushed Miscellaneous Base Material in accordance with 200-2.4, "Class 2 Aggregate Base."
6. 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."
7. The Contractor 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."
8. No preparatory asphalt work shall be done when the atmospheric temperature is below 50 °F or during unsuitable weather.
9. Following the asphalt placement, the Contractor 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, the Contractor shall seal all finished edges with a 4" wide continuous band of SS-1H.
10. The minimum dimension for each individual repair shall be 4' x 4' 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 the contractor shall use Class 2 Aggregate Base in accordance with 200-2.2, "Crushed Aggregate Base." Recycled base material shall conform to Crushed Miscellaneous Base Material in accordance with 200-2.4, "Crushed Miscellaneous Base."
 - c) The Contractor 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.

302-3.1 Asphalt Patching.

1. Asphalt patching shall consist of patching potholes, gutter-line erosion, and other low spots in the pavement that are deeper than ½" per 302-5.6.2, "Density and Smoothness." These areas are generally smaller and more isolated than those areas in need of mill and pave.
2. The areas requiring patching have been identified in the Contract Documents, marked on the streets, or as directed by the Engineer. The Contractor shall identify any new areas that may require patching prior to slurry work to ensure the smoothness and quality of the finished product.
3. The Contractor shall identify and repair any areas that may require patching, prior to the placement of slurry seal for smooth finished product.
4. Asphalt overlay shall not be applied over deteriorated pavement. Preparatory asphalt work shall be completed and approved by the Engineer before proceeding with asphalt overlay.
5. The Contractor 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 per 302-5.4, "Tack Coat".
7. Following the asphalt placement, the Contractor shall roll the entire patch in both directions covering the patch at least twice.
8. After placement and compaction of the asphalt patch, the Contractor shall seal all finished edges with a 4" wide continuous band of SS-1H.
9. Base repairs shall not exceed 20% RAP in content.

302-3.2 Payment.

1. Payment for replacement of existing pavement when required shall be included in the unit bid price for Asphalt Pavement repair for the total area replaced and no additional payment shall be made regardless of the number 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 the Contractor's failure to protect existing improvements. The Contractor 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 appendices are given only for the Contractor's 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 precedent 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, the Contractor 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. Preparatory repair work and tack coating will be paid at the Contract unit price per ton for Asphalt Pavement Repair. No payment shall be made for areas of over excavation unless previously approved by the Engineer.
5. Milling shall be included in the Bid item for Asphalt Pavement Repair unless separate Bid item has been provided.
6. Payment for miscellaneous asphalt patching shall be included in the Contract unit price for slurry and no additional payment shall be made therefore.

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

306-1.6 **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

306-20.8 **Carrier Pipe.** To the City Supplement, DELETE in its entirety and SUBSTITUTE with the following:

Carrier pipe materials shall be approved by the Engineer. The Contractor shall use only HDPE. The Contractor shall furnish and install a structurally sound, leak-proof, fusible high density polyethylene pipe, for all piping identified for installation by horizontal directional drilling. The Contractor shall be responsible for the sizing of the carrier pipe to withstand all installation forces, curvature, and residual forces and final in place loading. The selected material shall have an inside diameter no less than stated on the drawings. Individual pipe lengths shall be assembled by butt-fusion unless otherwise specified.

306-22 **PIPE FUSION.** DELETE in its entirety.

SECTION 308 – LANDSCAPE AND IRRIGATION INSTALLATION

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 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. 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, Testing, Sampling, Site Storage, and Handling of Soils Containing RCRA Hazardous Waste (TON).
- c) Loading, Transportation, and Disposal of soils containing RCRA Hazardous Waste (TON).
- d) Monitoring of Petroleum Contaminated Soil (HR).
- e) Testing, Sampling, Site Storage and Handling of Petroleum Contaminated Soil (TON).
- f) Loading, Transportation, and Disposal of Petroleum Contaminated Soil (TON).
- g) Monitoring, 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

705-2.6.1 **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 Notice of Exemption for **MBC Chemical System Improvements Phase II**, as referenced in the Contract Appendix. You must comply with all requirements of the Notice of Exemption as set forth in the Contract Appendix C.

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

CITY OF SAN DIEGO



TECHNICAL SPECIFICATIONS FOR

METROPOLITAN BIOSOLIDS CENTER (MBC) CHEMICAL SYSTEMS IMPROVEMENTS – PHASE II (CHIMPS2)

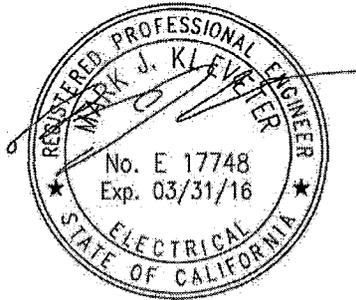
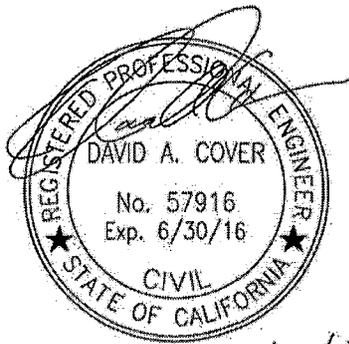
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METROPOLITAN BIOLSOLIDS CENTER CHEMICAL SYSTEMS IMPROVEMENTS PHASE II (CHIMPS2)

NOVEMBER 2014

In accordance with the provisions of the Business and Professions Code of the State of California, these contract documents have been prepared under the general supervision and direction of the following professional engineers, licensed in the State of California.



SUPPLEMENTAL TECHNICAL SPECIFICATIONS

DIVISION 1 GENERAL REQUIREMENTS

SECTION 01080 – CONSTRUCTION SEQUENCING

SECTION 01610 – GENERAL EQUIPMENT STIPULATIONS

SECTION 01611 – METEOROLOGICAL AND SEISMIC DESIGN CRITERIA

SECTION 01612 – PRODUCT DELIVERY REQUIREMENTS

SECTION 01614 – PRODUCT STORAGE AND HANDLING REQUIREMENTS

SECTION 01615 – EQUIPMENT AND VALVE IDENTIFICATION

SECTION 01650 – STARTUP REQUIREMENTS

DIVISION 2 SITEWORK

SECTION 2050 – DEMOLITION

DIVISION 3 CONCRETE

SECTION 03301 – MISCELLANEOUS CAST-IN-PLACE CONCRETE

SECTION 03600 – GROUTING

SECTION 03930 – CONCRETE CRACK REPAIR

DIVISION 5 METALS

SECTION 05120 – STRUCTURAL STEEL

SECTION 05500 – METAL FABRICATION

SECTION 05550 – ANCHORAGE IN CONCRETE AND MASONRY

DIVISION 6 WOOD AND PLASTICS

SECTION 06730 – FIBERGLASS REINFORCED PLASTIC

DIVISION 9 FINISHES

SECTION 09880 – CORROSION PROTECTION LINING SYSTEMS

SECTION 09940 – PROTECTIVE COATINGS

DIVISION 11 EQUIPMENT

SECTION 11060 – EQUIPMENT INSTALLATION

SECTION 11160 – PROGRESSING CAVITY PUMPS

SECTION 11727 – LIQUID CHEMICAL FEED SYSTEMS

DIVISION 13 SPECIAL CONSTRUCTION

SECTION 13300 – INSTRUMENTATION AND CONTROL

SECTION 13300A¹ - UPDATED CONTROL STRATEGIES (APPENDIX TO SECTION 13300)

SECTION 13300A – CS 16 FERROUS CHLORIDE SYSTEM

SECTION 13300A – CS 37 POLYMER BULK STORAGE HANDLING SYSTEM

SECTION 13300A – CS 38 FERROUS CHLORIDE BULK STORAGE HANDLING
SYSTEM

SECTION 13300A – CS 39 FERRIC CHLORIDE BULK STORAGE HANDLING
SYSTEM

SECTION 13300A – CS 40 CAUSTIC SODA BULK STORAGE HANDLING
SYSTEM

SECTION 13300A – CS 41 SULFURIC ACID BULK STORAGE HANDLING
SYSTEM

SECTION 13300A – CS 42 SODIUM HYPOCHLORITE BULK STORAGE
HANDLING SYSTEM

SECTION 13300B – I/O LIST

DIVISION 15 MECHANICAL

SECTION 15020 - MISCELLANEOUS PIPING AND ACCESSORIES INSTALLATION

SECTION 15067 – MISCELLANEOUS PLASTIC PIPE

SECTION 15091 – MISCELLANEOUS BALL VALVES

SECTION 15092 – INDUSTRIAL BUTTERFLY VALVES

SECTION 15093 – CHECK VALVES

SECTION 15097 – PINCH AND DIAPHRAGM VALVES

SECTION 15140 – PIPE SUPPORTS

SECTION 15180 – VALVE AND GATE ACTUATORS

DIVISION 16 ELECTRICAL

SECTION 16050 – ELECTRICAL

SECTION 16220 – COMMON MOTOR REQUIREMENTS FOR PROCESS EQUIPMENT

Section 01080

CONSTRUCTION SEQUENCING

1. DESCRIPTION. The intent of this Section is to provide the Contractor a suggested sequence to perform the Work in such a manner that all Plant processes, systems, services and facilities are maintained operational throughout the construction period. Construction sequencing plan (CSP) guidelines for individual chemical feed systems within the Plant have been developed by the Owner and Engineer. The Contractor shall prepare individual Contractor Construction Sequence Plans (CCSP) for each system and unit process based upon the requirements and constraints of the CSP's, this Section, the Contract Drawings and plant operations. Approval from the Engineer must be obtained for each individual CCSP prior to initiating WORK on the individual system or unit process. The CSP guidelines are provided at the end of this Section.

Except for the shutdown durations specified in this section, the Contractor's means and methods shall be implemented such that the existing plant shall remain in continuous satisfactory operation during the entire construction period. Work shall be scheduled and conducted by the Contractor such that it shall not impede any treatment process or interrupt plant operation, create potential hazards to operating equipment and Plant Personnel, or cause other nuisances. In performing the Work shown and specified, the Contractor shall plan and schedule the Work to meet both the constraints outlined in this Section and plant operating requirements.

Work not specifically covered on the Contract Drawings, in the CSP's or in the following paragraphs may, in general, be done at any time during the Contract period for this project, subject to the operating requirements outlined in this Section. All references to days in this Section are consecutive calendar days.

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 the Engineer prior to undertaking connections. Contractor shall protect facilities against deleterious substances and damage. 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.

Temporary chemical feed systems are not recommended. If utilized by the Contractor, temporary systems should be located within the empty containment

basin in the Area 60 tank farm and within each individual chemical system basin and pump basin (inside the buildings). All temporary systems utilized must include double containment systems (even when located in the existing containment basins) and shall include all monitoring equipment required to match the existing system operation. Contractor shall provide staff onsite full time (24 hours a day) during operation of any temporary systems to monitor and immediately correct any system failures.

The Contractor has the option of providing additional temporary facilities that can eliminate a constraint provided it is done without additional cost to the Owner and provided that all specified requirements are fulfilled.

The Contractor shall be responsible for coordinating all shutdowns with the Engineer and Plant Personnel as indicated in Part 3 of this Section, including notification time periods. The Contractor shall, whenever possible, combine discrete shutdown procedures identified in this Section or by the Contractor into a single shutdown when the duration of the shutdowns or the Work requirements allow such combining to occur on a unit process or work area. The intent of combining procedures is to minimize the impacts upon plant operations and processes by limiting the number of shutdowns required.

The Contractor shall not shut off or disconnect any operating system of the plant, unless approved by the Engineer, in writing. All existing plant equipment shall be operated and shutdown by the Plant Personnel, unless otherwise noted. Contractor shall seal plant operated gates and valves to prevent unnecessary leakage.

The Contractor shall be responsible for supplying all temporary pipelines, valves, pumps, storage tanks, meters, spare parts, electrical controls, and any other appurtenances required for the installation and operation of temporary chemical feed systems, bypass lines, pumping systems, or conveyance systems required to maintain operations of the plant during construction activities. The Contractor shall submit to the Engineer, for review and approval, the design for all temporary chemical feed systems, pipelines, pumping, or conveyance systems at least 30 days prior to the commencement of the Work.

All Contractor personnel, including subcontractors, on site shall have attended proper safety meetings for the MBC facility, including the MBC orientation safety training, as well as review of requirements for working with chemical systems and hazardous materials within the plant.

The following constraints shall be applied to all equipment and appurtenant utility systems on the plant site.

2. GENERAL CONSTRAINTS.

2.01. Load limits on Access Roads. Existing and new underground facilities, such as electrical duct banks, pipelines, etc., in, under, and crossing plant roads, have been designed for a maximum wheel load of AASHTO H-20. The Contractor shall not exceed this weight limit and shall provide means of protecting the underground facilities.

2.02. Access to Plant Site. An unobstructed traffic route through all plant gates shall be maintained at all times.

2.03. Safety Barriers. The Contractor shall place safety barriers, in accordance with OSHA regulations, around areas under construction located around operational areas accessible to Plant Personnel.

2.04. Personnel Access. Plant Personnel shall have access to all areas throughout the construction period.

2.05. Plant Water and Reclaimed Water System. The existing plant water systems including the domestic water, process water and reclaimed water systems shall be kept in operation at all times, unless otherwise specified.

2.06. Plumbing Facilities. Sanitary facilities in the existing structures shall be operational at all times for Plant Personnel. All other building plumbing systems, such as roof and floor drains, pumping, etc., shall be maintained for all structures.

2.07. Storm Drainage. Storm drainage on the site shall be operational at all times, unless otherwise specified.

2.08. Building Heating and Ventilating. In the Contractor's Work areas and areas affected by the Contractor's operations, building heating and ventilating shall be provided and maintained in structures. The temperatures to be maintained in any area occupied by Plant Personnel, such as offices, lunchrooms, locker rooms, toilet rooms, facilities containing computer control equipment, etc., shall be at least 65° F and not greater than 80° F. The temperatures to be maintained in all other interior plant areas, whether new, existing or temporary, shall be maintained at a minimum of 55° F and not greater than 90° F.

2.09. Power, Light, and Communication Systems. Electric power, lighting service, and communication systems shall be maintained in uninterrupted operation in all areas.

2.10. Sump Pumps and Sumps. All existing sumps shall be maintained in an operable condition with either existing pumps or temporary pumps provided by the Contractor. Interim piping, power, and controls shall be provided by the Contractor, as required by the construction sequence and as directed by the Engineer.

2.11. Seal and Service Water Piping. A supply of service and seal water and the necessary connections to existing equipment shall be maintained during construction, unless otherwise specified. Interim piping shall be provided by the Contractor, as required.

2.12. Cleaning. The Contractor under supervision from the Engineer will dewater process basins and other Work areas. It is the Contractor's responsibility to maintain a clean and dry work area by pumping all washdown and cleaning water, storm water, and other liquids that accumulate in the Work areas.

2.13. Draining Process Pipes and Conduits. Contractor shall coordinate draining of pipes and conduits with the Plant Personnel and submit proposed method of draining in writing to the Engineer for approval. Contractor shall provide any hoses, piping, or pumps necessary for draining pipes or conduits. No facilities shall be allowed to drain to the storm water drainage system unless specifically approved by the Engineer.

As the MBC facility is currently in standard operation, the chemical feed system piping, valves, pumps, equipment and appurtenances may be full of chemicals prior to demolition and improvement work to be performed by the Contractor. The Plant Personnel will assist with shutting down pumps and closing valves. The Plant Personnel will not assure the piping, valves, pumps, equipment and appurtenances are empty of the system chemical. The Contractor shall properly drain, handle, transfer and dispose of all residual chemicals from piping, pumps, valves, equipment and appurtenances per OSHA regulations and the City's facility safety requirements. As part of the CCSP, for each chemical feed system, the Contractor shall submit a written plan of the proposed disposal method(s), including draining, handling, transfer and location of disposal.

2.14. Temporary Partitions and Enclosures. The Contractor shall provide temporary partitions and enclosures as shown and necessary to maintain dust-free, heated, and ventilated spaces in all areas which are adjacent to his Work and which must be kept operational by the plant.

2.15. Dead End Valves or Pipe. Contractor shall provide blind flanges on all valves or pipes which dead-end a line on a temporary or permanent basis. Blind flanges shall be braced and blocked, as required or as directed by the Engineer in the field.

2.16. Start-up Scheduling. The Contractor shall schedule all startups for Monday through Thursday. No startups will be allowed on Friday, Saturday, and Sunday, unless approved by the Engineer.

2.17. Normal Plant System Operations Scheduling. The Contractor shall schedule all work such that all Plant processes, systems, services and facilities

are maintained operational throughout the construction period. No extended shutdowns will be allowed. All shutdowns and temporary systems must be coordinated with and approved by the Engineer and Plant Personnel.

Pipe and equipment joint solvent curing times (per the manufacturer's recommendations) shall be taken into account in the development of the CCSPs. If the Contractor's proposed installation schedule results in a conflict between the allowable shutdown period and the joint solvent cure time, the Contractor at no additional cost to the Owner will be responsible for providing alternative assembly methods that do not require joint solvent. All efforts shall be made to limit the location of alternative assembly methods. All alternative assembly methods and locations proposed shall be submitted by the Contractor and approved by the Engineer prior to installation.

2.18. Spill Containment. All costs associated with a spill event caused by the actions of the Contractor shall be the Contractor's responsibilities. The Contractor shall maintain at all times the appropriate equipment and staff to contain any spill event that may result from his construction activities or construction sequencing.

2.19. Staffing. The Contractor shall maintain at all times the appropriate amount of staff to perform any temporary operation as identified within the CCSPs. The Contractor cannot rely on the Plant Personnel to operate or maintain the Contractor's temporary system at any time.

2.20. Interim Piping Configurations. The Contract Documents depict the proposed final configuration of process piping for operation of the proposed and existing facilities. As part of the requirements for maintaining plant operations, the Contractor may be required to substitute tees for 90 degree bends, and/or furnish and install temporary fittings and valves to allow for the successful operation of interim facilities. All temporary fittings, couplings, blind flanges, and test fittings shall be furnished and installed on an interim basis at no additional cost. All spool pieces, couplings, and appurtenances needed but not shown to restore temporary pipe configurations to the final configuration shall be furnished and installed at no additional cost.

2.21. Commissioning. Where new mechanical equipment is due to be commissioned and the MCC and electrical equipment are not in place, the Contractor will be required to install, commission, test and decommission any temporary electrical hardware and equipment at no additional cost.

3. SHUTDOWNS

3.01 Unit Shutdowns. A shutdown shall be defined as a portion of the normal operation of a plant unit that has to be suspended or taken out of service in order

to perform the specified Work. For each shutdown, the Contractor shall compile an inventory of labor and materials required to perform tasks, an estimate of the time required, and a written description of steps required to complete all tasks. The inventory, the estimate, and written procedures shall be included in the CCSP prepared for each individual system or unit process, and shall be submitted to the Engineer and Plant Personnel for review and approval 45 calendar days prior to the proposed start date of the shutdown. The Contractor shall also request, in writing from the Engineer, approval for each shutdown a minimum of 14 calendar days prior to the proposed shutdown date. No shutdown shall be initiated until the CCSP is approved, and the inventory of materials and labor is verified by the Engineer onsite at least one week prior to the proposed shutdown date.

The Work required herein and any other Work required by the Engineer that may interrupt the normal plant operations shall be accomplished at such times that will be convenient to the Plant Personnel. Plant Personnel shall be notified of all Lock-Out-Tag-Out (LOTO) operations prior to the Contractor locking out any system.

During shutdown periods, the Contractor shall also have on hand and located within the Plant work limits, all tools, equipment, spare parts, and materials, both temporary and permanent, necessary to complete the Work without interruption. Adequate numbers of Contractor personnel shall be scheduled for each shutdown, so that the Work is accomplished within the specified time frame. Prefabrication of all piping and other assemblies shall be completed, to the greatest degree possible, prior to any shutdown. The Engineer shall be satisfied that the Contractor has complied with these requirements, to the fullest extent possible, before shutdowns will be authorized.

For shutdowns of electrical systems, the Contractor shall lock out and tag out circuit breakers and switches, and shall check cables and wires to be sure that they are de-energized to ground potential before Work begins. Upon completion of the Work, the Contractor shall remove the locks and tags and notify the Engineer and Plant Personnel that the facilities are available for use.

Plant Personnel shall be able to continue performing administrative, operation, and maintenance functions during all shutdowns. These functions shall not be hindered or impeded by the Contractor's Work.

3.02 Unscheduled Shutdowns. Penalties imposed on the Owner as a result of any unscheduled shutdown caused by the actions of the Contractor or subcontractors, shall be born in full by the Contractor, including legal fees and other expenses to the Owner resulting directly or indirectly from the unscheduled shutdown.

If the Contractor's procedures cause an unscheduled shutdown of the facilities,

the Contractor shall continuously perform Work as necessary to immediately re-establish satisfactory operation. The Contractor shall notify the Engineer and Plant Personnel, in writing, immediately of any unscheduled shutdown. The Contractor shall permit Plant Personnel to work with Contractor's personnel, as required, to maintain the plant in continuous satisfactory operation.

Unscheduled shutdown and/or interruption of continued safe and satisfactory operation of the facilities that result in fines levied by the U.S. Environmental Protection Agency, Regional Water Quality Control Board, San Diego Air Pollution Control Board, the City of San Diego, the County of San Diego or any other agency, shall be the responsibility of the Contractor if it is demonstrated that the Contractor was negligent in his Work or did not exercise proper precautions in the conduct of his Work.

4. SCHEDULE. Each CCSP shall include a detailed outage plan and time schedule for operations, which will make it necessary to remove, repair, replace, or empty a tank, pumps, pipelines, instruments, electrical circuits, equipment or structures from service. The outage plan and time schedule shall be coordinated with the overall construction schedule specified in the Whitebook and Greenbook and shall meet the restrictions and conditions specified in this Section.

5. CONTRACTOR CONSTRUCTION SEQUENCE PLANS. The Engineer and Owner developed Construction Sequencing Plan (CSP) guidelines indicating general shutdown requirements and constraints. The CSP guidelines are provided at the end of this Section, including an identification number, associated construction period constraints, and brief description of the Work to be performed by the Contractor. The CSPs do not address all required tie-ins and connections for the Work, and include general information and requirements for tie-ins anticipated to be of significant impact to plant operations. The Contractor is required to make all tie-ins, connections, and replacements necessary to perform the Work, even if not indicated in the CSP guidelines.

The CSP guidelines included in this Section are intended to provide Contractor an understanding of which facilities and in what order those facilities will be made available for the Contractor's work, as well as, generally identifying the Engineer's and Plant Personnel's specific requirements for Work to be performed. The successful completion of the Project will require that the Contractor satisfy all CSP guidelines requirements although the specific means and methods employed to do so will be Contractor's sole responsibility. Alterations to the CSP guidelines proposed by Contractor for the Engineer's consideration shall be clearly documented as part of the CCSP submittal process.

At a minimum, the Contractor shall develop individual detailed Contractor CONSTRUCTION SEQUENCE PLANS (CCSP) for each of the systems and unit process contained in the CSP guidelines contained herein, and shall develop

additional CCSPs as necessary to perform the work contained in the Contract Documents. The individual CCSPs shall be submitted to the Engineer for review and approval in accordance with the Greenbook and Whitebook Submittals section and the following:

- Within thirty (30) days following the Notice to Proceed, the Contractor shall meet with the Engineer and Plant Personnel to review the CSP guidelines (CSP Review Meeting).
- The Contractor shall coordinate the sequence of construction requirements with the contract schedule requirements set forth in the Greenbook and Whitebook Contractor's Schedule Section. The individual CCSPs shall be incorporated into the overall project schedule showing relationships and timing.
- As a minimum, each individual CCSP shall contain details of the following:
 - Step by step tasks for completing the Work
 - Manpower required for each task
 - Duration planned for each task
 - Shutdowns to be performed, including dates and time periods
 - List of equipment, materials and processes to be shutdown, removed and replaced
 - Materials and specialized equipment required for the Work
 - Temporary facilities, equipment and systems to be installed for the Work, including location and layout
 - Copies of drawings, photos, or field sketches to help define the Work
 - Constraints identified for the Work
 - Special coordination requirements
 - Special safety issues or procedures identified by the Contractor for the Work
 - Methods for removal, handling, transfer disposal of system chemicals

6. CONTRACTOR QUALIFICATIONS. Project improvements will be performed in an active City wastewater treatment plant facility (WWTP). All plant processes, systems, services and facilities are to be maintained in operation through the entire construction period. See construction sequencing plans for additional details and requirements relating to each specific system.

Upon receipt of approval of the Good Faith Effort Documentation, the apparent low bidder shall submit a package indicating fulfillment of the qualifications and experience required in this section.

6.1 Contractor's Experience and Past Project Documentation. Documentation shall be submitted showing comparable experience in projects similar in scope and size that have been successfully installed within the United States for each of the improvement types listed. In addition, documentation indicating successful performance by the contractor, contractor team including subcontractors, and personnel assigned to this project including detailed client reference information for each project.

For documentation submitted, including for proposed Contractor and subcontractors, each referenced project shall include, but shall not be limited to the following:

- Project name, including construction calendar years, facility size (capacity), facility type and location.
- Owner contact, including name, agency, title, phone number and e-mail.

Owner contact reference may be contacted to confirm information submitted.

Improvement Types and Required Experience

1. WWTP Experience – experience working within an existing WWTP of similar capacity – 3 facilities within the past 5 years.
2. Chemical Feed System Experience – experience working on chemical feed system installations with similar mechanical equipment and chemicals – 3 facilities within the past 5 years.
3. Corrosion protection and coatings experience – experience removing and installing corrosion protection and coatings on similar projects - 3 facilities within the past 5 years.
4. Electrical system experience – experience removing and installing electrical systems in an active facility on similar projects - 3 facilities within the past 5 years.
5. System Startup experience – experience starting up mechanical, chemical feed and electrical systems within WWTPs of similar capacity – 3 facilities within the past 5 years.

End of Section

Construction Sequencing Plan (CSP) 1.00: Chemical Building & Tank Farm Improvements (Area 60)			
Location:	Area 60 Chemical Building and Tank Farm	Storage Tanks Operating / Available (Normal Conditions):	See each chemical system CSP
General Operation:	Storage, supply and transfer of various chemicals from Area 60 to multiple locations and facilities within the MBC plant	Minimum Storage Tanks Operating (Improvement Work Condition):	See each chemical system CSP
		Pumps Operating / Available (Normal Conditions):	See each chemical system CSP
Related Control System:	Section 13300 and all Section 13300 appendices	Minimum Pumps Operating (Improvement Work Condition):	See each chemical system CSP
Related CSPs:	1.01 thru 1.07, 2.01, 3.01	Daily Usage:	See each chemical system CSP
Related Process Flow Diagrams:	See each chemical system CSP	Maximum Shutdown Duration:	See each chemical system CSP
Task Description:	All improvements indicated for Area 60, including chemical system modifications, electrical relocations, catwalk platform additions and modifications, chemical basin coatings, polymer dilution station removal, and other improvements in the drawings and contained in the specifications.		
Constraints	<ul style="list-style-type: none"> • See each chemical system CSP for individual system constraints • Improvements to chemical systems are recommended to be performed individually at different times. If more than one chemical system improvement is performed during the same time period, the improvements can only be performed in the combinations noted below. Combining system improvements other than those listed will not be allowed. <ol style="list-style-type: none"> 1) Sulfuric acid and ferric chloride (Area 60 and 76) 2) Sodium hydroxide, sodium hypochlorite and ferrous chloride (Area 60 and 80) 3) Polymer bulk storage 		

Construction Sequencing Plan (CSP) 1.00: Chemical Building & Tank Farm Improvements (Area 60)	
	<ul style="list-style-type: none"> 4) Combined polymer mixing • Electrical, coating and structural improvements shall be performed to meet the constraints indicated in each chemical system CSP. • Temporary systems are not recommended. See Section 01080 for additional information.
OWNER Role & Tasks:	<ul style="list-style-type: none"> • Continued operation of all Area 60 systems. • Modification to the DCS control system in coordination with the permanent improvements. Modifications by Owner will include: DCS programming, installation and removal of DCS equipment, and update of DCS O&M manuals.
CONTRACTOR Role & Tasks:	<ul style="list-style-type: none"> • See each chemical system CSP for specific roles and tasks. • Perform all work required for this area in the drawings and specifications with complete systems meeting the intended improvements and proposed operations, including but not limited to: <ul style="list-style-type: none"> ○ Reconfigure and improve various chemical systems with new piping, valves, actuators, pumps, monitoring instruments and other appurtenances. ○ Properly drain all residual chemicals from chemical systems per Section 01080. ○ Demolition of existing dilution polymer systems. ○ Install new catwalk access platforms, handrail and ladders. ○ Relocate four existing eyewash showers and connect to DCS. ○ Remove and recoat each chemical system storage basin. ○ Remove and relocate wiring and conduits (power and control). ○ Preparation of loop drawings. ○ Assistance with DCS system cutovers and startups. • Attend proper safety meetings for the MBC facility.
ENGINEER Role & Tasks:	<ul style="list-style-type: none"> • Review of CCSP and construction schedules.

Construction Sequencing Plan (CSP) 1.01: Sulfuric Acid Feed System (Area 60)			
Location:	Area 60 Chemical Building and Tank Farm	Storage Tanks Operating / Available (Normal Conditions):	2 (not currently in operation) (60-T-61, 62)
General Operation:	System is currently offline (permanently)	Minimum Storage Tanks Operating (Improvement Work Condition):	0
		Pumps Operating / Available (Normal Conditions):	2 transfer (not currently in operation) (60-P-66, 67) 4 feed (not currently in operation) (60-P-61, 62, 63, 64)
Related Control System:	Section 13300 – Appendix A – CS41	Minimum Pumps Operating (Improvement Work Condition):	0
Related CSPs:	1.00	Daily Usage:	Not applicable
Related Process Flow Diagrams:	60-D-22, 60-M-22	Maximum Shutdown Duration:	No limit
Task Description:	Sulfuric acid system is no longer utilized. Storage tanks and piping to be prepared for future use (of possible different chemicals). Existing feed pumps to be removed. Conduit and wiring modifications (power and control).		
Constraints	<ul style="list-style-type: none"> • Perform improvements prior to all other systems. The sulfuric acid system improvements can be performed concurrently with the ferric chloride system improvements. • Improvements cannot be performed concurrently with the sodium hypochlorite, sodium hydroxide or ferrous chloride system improvements. • Improvements cannot be performed concurrently with any of the polymer system improvements. 		

Construction Sequencing Plan (CSP) 1.01: Sulfuric Acid Feed System (Area 60)	
OWNER Role & Tasks:	<ul style="list-style-type: none"> Continued operation of all adjacent chemical feed systems. Modification to the DCS control system in coordination with the permanent improvements. Modifications by Owner will include: DCS programming, installation and removal of DCS equipment, and update of DCS O&M manuals.
CONTRACTOR Role & Tasks:	<ul style="list-style-type: none"> Demolition and removal of piping, valves, strainers and other appurtenances from storage tanks to transfer and feed pumps, and from pumps to termination location within chemical building. Demolition and removal of transfer and feed pumps. Properly drain all residual chemicals from chemical systems per Section 01080. Installation of new piping, valves, monitoring instruments and other appurtenances from storage tanks to chemical building for future use by OWNER. Maintain cleanliness of the storage tanks. Extension of valve / limit switch operators. Relocation and installation of new wiring, conduits and appurtenances (power). Relocation and installation of new wiring and conduits (control). Preparation of loop drawings. Assistance with DCS system cutovers and startups. Attend proper safety meetings for the MBC facility.
ENGINEER Role & Tasks:	<ul style="list-style-type: none"> Review of CCSP and construction schedules.

Construction Sequencing Plan (CSP) 1.02: Ferric Chloride Transfer System (Area 60)			
Location:	Area 60 Chemical Building and Tank Farm	Storage Tanks Operating / Available (Normal Conditions):	2 (not currently in operation) (60-T-71, 72)
General Operation:	System is currently offline (permanently)	Minimum Storage Tanks Operating (Improvement Work Condition):	0
		Pumps Operating / Available (Normal Conditions):	2 transfer (not currently in operation) (60-P-73, 74)
Related Control System:	Section 13300 – Appendix A – CS39	Minimum Pumps Operating (Improvement Work Condition):	0
Related CSPs:	1.00, 2.01	Daily Usage:	Not applicable
Related Process Flow Diagrams:	60-D-31, 60-M-31	Maximum Shutdown Duration:	No limit
Task Description:	Ferric chloride system is no longer utilized. Piping to be prepared for future use (of possible different chemicals). Conduit and wiring modifications (power and control).		
Constraints	<ul style="list-style-type: none"> • Perform improvements prior to all other systems. • Improvements can be performed concurrently with the sulfuric acid system improvements. • Improvements cannot be performed concurrently with the sodium hypochlorite, sodium hydroxide or ferrous chloride system improvements. • Improvements cannot be performed concurrently with any of the polymer system improvements. 		
OWNER Role & Tasks:	<ul style="list-style-type: none"> • Continued operation of all adjacent chemical feed systems. • Modification to the DCS control system in coordination with the permanent improvements. Modifications by Owner will include: DCS programming, installation and removal of DCS equipment, and update of DCS O&M manuals. 		

Construction Sequencing Plan (CSP) 1.02: Ferric Chloride Transfer System (Area 60)	
CONTRACTOR Role & Tasks:	<ul style="list-style-type: none"> • Demolition and removal of pump supply piping, valves, actuators and other appurtenances from storage tanks to pumps. • Demolition and removal of pump discharge piping, valves, actuators and other appurtenances from pumps to the storage tank return and to the feed piping connection within the Area 60 pump room containment basin. • Demolition and removal of electrical system. • Properly drain all residual chemicals from chemical systems per Section 01080. • Installation of new piping, valves, actuators, and other appurtenances from storage tanks to the pumps. • Installation of new piping, valves, actuators, monitoring instruments and other appurtenances from the pumps to the storage tank return and Area 76 feed piping. • Extension of valve / limit switch operators. • Relocation and installation of new wiring, conduits and appurtenances (power). • Relocation and installation of new wiring and conduits (control). • Preparation of loop drawings. • Assistance with DCS system cutovers and startups. • Attend proper safety meetings for the MBC facility.
ENGINEER Role & Tasks:	<ul style="list-style-type: none"> • Review of CCSP and construction schedules.

Construction Sequencing Plan (CSP) 1.03: Ferrous Chloride Transfer System (Area 60)			
Location:	Area 60 Chemical Building and Tank Farm	Storage Tanks Operating / Available (Normal Conditions):	2 (60-T-81, 82)
General Operation:	Transfer system to supply ferrous chloride feed system in Area 80 that feeds chemical to the digesters	Minimum Storage Tanks Operating (Improvement Work Condition):	1
		Pumps Operating / Available (Normal Conditions):	2 transfer (60-P-71, 72)
Related Control System:	Section 13300 – Appendix A - CS38	Minimum Pumps Operating (Improvement Work Condition):	1
Related CSPs:	1.00, 3.01	Daily Usage:	500 to 600 gallons
Related Process Flow Diagrams:	60-D-31, 60-M-31	Maximum Shutdown Duration:	12 hours (both Area 80 storage tanks must be full and in service)
Task Description:	Removal of existing piping, valves, actuators, and appurtenances in both the storage tank and pump room locations on both sides of the pumps. Replacement with new piping, valves, actuators and appurtenances to provide two supply pipelines from the storage tanks to the pumps, return lines to the tanks, stand pipe and new connection to the Area 80 feed pipeline. Conduit and wiring modifications (power and control).		
Constraints	<ul style="list-style-type: none"> • Perform improvements after the sulfuric acid and ferric chloride system improvements are complete. • Perform improvements prior to any of the polymer system improvements. • Improvements cannot be performed concurrently with the Area 80 ferrous chloride improvements. • Improvements must be performed after the Area 80 ferrous chloride feed system improvements are complete and the feed system is in operation, including operation of both Area 80 storage tanks. • Improvements cannot be performed concurrently with improvements to any of the polymer systems. 		

Construction Sequencing Plan (CSP) 1.03: Ferrous Chloride Transfer System (Area 60)

**OWNER
Role & Tasks:**

- Continued operation of all adjacent chemical feed systems.
- Assistance with equipment shutdown and isolation prior to performing improvements and making required connections.
- Assistance during startup of the connected improvements to place system back online and in operation by Owner forces within the allowable shutdown duration.
- Modification to the DCS control system in coordination with the permanent improvements. Modifications by Owner will include: DCS programming, installation and removal of DCS equipment, and update of DCS O&M manuals.

**CONTRACTOR
Role & Tasks:**

- Demolition and removal of pump supply piping, valves, actuators and other appurtenances from storage tanks to pumps.
- Demolition and removal of pump discharge piping, valves, actuators and other appurtenances from pumps to the storage tank return and to the feed piping connection within the Area 60 pump room containment basin.
- Properly drain all residual chemicals from chemical systems per Section 01080.
- Installation of new piping, valves, actuators, and other appurtenances from storage tanks to the pumps.
- Installation of new piping, valves, actuators, monitoring instruments and other appurtenances from the pumps to the storage tank return and Area 80 feed piping.
- Extension of valve / limit switch operators.
- Relocation and installation of new wiring, conduits and appurtenances (power).
- Relocation and installation of new wiring and conduits (control).
- Preparation of loop drawings.
- Assistance with DCS system cutovers and startups.
- Attend proper safety meetings for the MBC facility.

**ENGINEER
Role & Tasks:**

- Review of CCSP and construction schedules.

Construction Sequencing Plan (CSP) 1.04: Sodium Hydroxide (Caustic) Feed and Transfer System (Area 60)			
Location:	Area 60 Chemical Building and Tank Farm	Storage Tanks Operating / Available (Normal Conditions):	2 (60-T-41, 42)
General Operation:	Feed system to supply odor control (wet scrubber) system in Area 60 and transfer system to supply Area 80	Minimum Storage Tanks Operating (Improvement Work Condition):	1
		Pumps Operating / Available (Normal Conditions):	2 transfer (60-P-46, 47) 6 feed (3 pump trains) (60-P-41, 42, 43, 44, 48, 49)
Related Control System:	Section 13300 – Appendix A - CS40	Minimum Pumps Operating (Improvement Work Condition):	1 transfer 4 feed (two pump trains)
Related CSPs:	1.00	Daily Usage:	30 gallons
Related Process Flow Diagrams:	60-D-21, 60-M-21	Maximum Shutdown Duration:	12 hours
Task Description:	Removal and replacement of piping and valves to provide two supply pipelines from the storage tanks to the pumps. Conduit and wiring modifications (power and control).		
Constraints	<ul style="list-style-type: none"> • Perform improvements after the sulfuric acid and ferric chloride system improvements are complete. • Improvements can be performed concurrently with the sodium hypochlorite and ferrous chloride system improvements. • Improvements cannot be performed concurrently with any of the polymer systems improvements. 		
OWNER Role & Tasks:	<ul style="list-style-type: none"> • Continued operation of all adjacent chemical feed systems. • Assistance with equipment shutdown and isolation prior to performing improvements and making required connections. • Assistance during startup of the connected improvements to place system back online and in operation 		

Construction Sequencing Plan (CSP) 1.04: Sodium Hydroxide (Caustic) Feed and Transfer System (Area 60)

by Owner forces within the allowable shutdown duration.

- Modification to the DCS control system in coordination with the permanent improvements. Modifications by Owner will include: DCS programming, installation and removal of DCS equipment, and update of DCS O&M manuals.

**CONTRACTOR
Role & Tasks:**

- Demolition and removal of piping, valves, strainers and other appurtenances from storage tanks to pump room
- Properly drain all residual chemicals from chemical systems per Section 01080.
- Installation of new piping, valves, monitoring equipment and other appurtenances from storage tanks to pump room.
- Extension of valve / limit switch operators.
- Relocation and installation of new wiring, conduits and appurtenances (power).
- Relocation and installation of new wiring and conduits (control).
- Preparation of loop drawings.
- Assistance with DCS system cutovers and startups.
- Attend proper safety meetings for the MBC facility.

**ENGINEER
Role & Tasks:**

- Review of CCSP and construction schedules.

Construction Sequencing Plan (CSP) 1.05: Sodium Hypochlorite Feed System (Area 60)			
Location:	Area 60 Chemical Building and Tank Farm	Storage Tanks Operating / Available (Normal Conditions):	2 (60-T-51, 52)
General Operation:	Feed system to supply odor control (wet scrubber) system in Area 60	Minimum Storage Tanks Operating (Improvement Work Condition):	1
		Pumps Operating / Available (Normal Conditions):	2 transfer (not currently in operation) (60-P-56, 57) 6 feed (3 pump trains) (60-P-51, 52, 53, 54, 58, 59)
Related Control System:	Section 13300 – Appendix A - CS42	Minimum Pumps Operating (Improvement Work Condition):	0 transfer 4 feed (2 pump trains)
Related CSPs:	1.00	Daily Usage:	120 gallons
Related Process Flow Diagrams:	60-D-21, 60-M-21	Maximum Shutdown Duration:	12 hours
Task Description:	Removal and replacement of piping and valves to provide two supply pipelines from the storage tanks to the feed pumps. Removal of existing transfer pumps and appurtenances. Conduit and wiring modifications (power and control).		
Constraints	<ul style="list-style-type: none"> • Perform improvements after the sulfuric acid and ferric chloride system improvements are complete. • Improvements can be performed concurrently with the sodium hydroxide (caustic) and ferrous chloride system improvements. • Improvements cannot be performed concurrently with any of the polymer systems improvements. 		
OWNER Role & Tasks:	<ul style="list-style-type: none"> • Continued operation of all adjacent chemical feed systems. • Assistance with equipment shutdown and isolation prior to performing improvements and making required connections. • Assistance during startup of the connected improvements to place system back online and in operation 		

Construction Sequencing Plan (CSP) 1.05: Sodium Hypochlorite Feed System (Area 60)	
	<p>by Owner forces within the allowable shutdown duration.</p> <ul style="list-style-type: none"> • Modification to the DCS control system in coordination with the permanent improvements. Modifications by Owner will include: DCS programming, installation and removal of DCS equipment, and update of DCS O&M manuals.
CONTRACTOR Role & Tasks:	<ul style="list-style-type: none"> • Demolition and removal of piping, valves, strainers and other appurtenances from storage tanks to pump room. • Demolition and removal of transfer feed pumps and appurtenances. • Properly drain all residual chemicals from chemical systems per Section 01080. • Installation of new piping, valves, monitoring equipment and other appurtenances from storage tanks to pump room. • Extension of valve / limit switch operators. • Relocation and installation of new wiring, conduits and appurtenances (power). • Relocation and installation of new wiring and conduits (control). • Preparation of loop drawings. • Assistance with DCS system cutovers and startups. • Attend proper safety meetings for the MBC facility.
ENGINEER Role & Tasks:	<ul style="list-style-type: none"> • Review of CCSP and construction schedules.

Construction Sequencing Plan (CSP) 1.06: Polymer Bulk Storage System (Area 60)			
Location:	Area 60 Chemical Building and Tank Farm	Storage Tanks Operating / Available (Normal Conditions):	6 (60-T-1, 2, 11, 12, 13, 14)
General Operation:	Polymer storage system to transfer polymer to polymer mixed tanks	Minimum Storage Tanks Operating (Improvement Work Condition):	2
		Pumps Operating / Available (Normal Conditions):	4 transfer (60-P-1, 2, 6, 7)
Related Control System:	Section 13300 – Appendix A – CS37	Minimum Pumps Operating (Improvement Work Condition):	1 transfer
Related CSPs:	1.00, 1.07	Daily Usage:	5,000 gallons
Related Process Flow Diagrams:	60-D-2, 60-D-3, 60-M-2A, and 60-M-3A	Maximum Shutdown Duration:	12 hours (Thursday only)
Task Description:	Removal of existing piping and valves within exterior containment basins and interior pump room. Replacement with new piping and valves to provide a single looped polymer storage system (merging existing thickening and dewatering polymer storage tanks) to supply polymer from any polymer storage tank to polymer mixing tanks. Conduit and wiring modifications (power and control). Extension and/or relocation of valve operators.		
Constraints	<ul style="list-style-type: none"> • Installation of new improvements (piping, valves, etc.) not requiring connection to the existing system should be performed first (when feasible) to minimize system shutdowns. Shutdowns should be performed only for connections between new improvements and existing materials (piping, valves, pumps, etc.). • Shutdowns limited to Thursday's. • Perform improvements after the sulfuric acid, ferric chloride, sodium hypochlorite, sodium hydroxide and ferrous chloride system improvements are complete. • Perform improvements prior to the polymer mixing system improvements. 		
OWNER Role & Tasks:	<ul style="list-style-type: none"> • Continued operation of all adjacent chemical feed systems. • Assistance with equipment shutdown and isolation prior to performing improvements and making required 		

Construction Sequencing Plan (CSP) 1.06: Polymer Bulk Storage System (Area 60)

connections.

- Assistance during startup of the connected improvements to place system back online and in operation by Owner forces within the allowable shutdown duration.
- Modification to the DCS control system in coordination with the permanent improvements. Modifications by Owner will include: DCS programming, installation and removal of DCS equipment, and update of DCS O&M manuals.

**CONTRACTOR
Role & Tasks:**

- Demolition and removal of piping, valves and other appurtenances from storage tanks to pumps.
- Properly drain all residual chemicals from chemical systems per Section 01080.
- Installation of new piping, valves monitoring instruments and other appurtenances from storage tanks to pump room.
- Installation of new piping, valves, actuators, monitoring instruments and other appurtenances from the pumps to the storage tank return and feed piping.
- Relocation and/or extension of valve operators.
- Relocation and installation of new wiring, conduits and appurtenances (power).
- Relocation and installation of new wiring and conduits (control).
- Preparation of loop drawings.
- Assistance with DCS system cutovers and startups.
- Attend proper safety meetings for the MBC facility.

**ENGINEER
Role & Tasks:**

- Review of CCSP and construction schedules.

Construction Sequencing Plan (CSP) 1.07: Combined Polymer Mixing & Transfer System (Area 60)			
Location:	Area 60 Chemical Building and Tank Farm	Storage Tanks Operating / Available (Normal Conditions):	4 (60-T-21, 22, 23, 24)
General Operation:	Mixing of polymer and transfer system to supply the polymer day tanks within the MBC facility	Minimum Storage Tanks Operating (Improvement Work Condition):	3
		Pumps Operating / Available (Normal Conditions):	3 transfer (60-P-11, 12, 13)
Related Control System:	Section 13300 – Appendix A - TBD	Minimum Pumps Operating (Improvement Work Condition):	1 transfer
Related CSPs:	1.00, 1.06	Daily Usage:	80,000 gallons
Related Process Flow Diagrams:	60-D-4, 60-M-4A	Maximum Shutdown Duration:	24 hours (transfer to thickening) 0 hours (transfer to dewatering)
Task Description:	Removal of existing small pump (60-P-11) and replacement with new larger pump, including removal and replacement of piping and valves to account for the pump capacity increase. Conduit and wiring modifications and relocations (power and control). Extension and/or relocation of valve operators.		
Constraints	<ul style="list-style-type: none"> • Installation of new improvements (pump, piping, valves, etc.) not requiring connection to the existing system should be performed first (when feasible) to minimize system shutdowns. Shutdowns should be performed only for connections between new improvements and existing materials (piping, valves, pumps, etc.). • Shutdowns limited to Thursday's. • Perform improvements after the sulfuric acid, ferric chloride, sodium hypochlorite, sodium hydroxide and ferrous chloride system improvements are complete. • Perform improvements after the polymer storage system improvements. 		

Construction Sequencing Plan (CSP) 1.07: Combined Polymer Mixing & Transfer System (Area 60)	
OWNER Role & Tasks:	<ul style="list-style-type: none"> Continued operation of all adjacent chemical feed systems. Assistance with equipment shutdown and isolation prior to performing improvements and making required connections. Assistance during startup of the connected improvements to place system back online and in operation by Owner forces within the allowable shutdown duration. Modification to the DCS control system in coordination with the permanent improvements. Modifications by Owner will include: DCS programming, installation and removal of DCS equipment, and update of DCS O&M manuals.
CONTRACTOR Role & Tasks:	<ul style="list-style-type: none"> Demolition and removal of pump, piping, valves, and other appurtenances from within pump room. Properly drain all residual chemicals from chemical systems per Section 01080. Installation of new pump, piping, valves, monitoring instruments and other appurtenances within pump room. Relocation and/or extension of valve operators. Relocation and installation of new wiring, conduits and appurtenances (power). Relocation and installation of new wiring and conduits (control). Preparation of loop drawings. Assistance with DCS system cutovers and startups. Attend proper safety meetings for the MBC facility.
ENGINEER Role & Tasks:	<ul style="list-style-type: none"> Review of CCSP and construction schedules.

Construction Sequencing Plan (CSP) 2.00: Centrifuge Building Improvements (Area 76)			
Location:	Area 76 Centrifuge Building	Storage Tanks Operating / Available (Normal Conditions):	See each chemical system CSP
General Operation:	Ferric chloride feed system is no longer in use. Transfer and recycled water dilution of polymer.	Minimum Storage Tanks Operating (Improvement Work Condition):	See each chemical system CSP
		Pumps Operating / Available (Normal Conditions):	See each chemical system CSP
Related Control System:	Not applicable	Minimum Pumps Operating (Improvement Work Condition):	See each chemical system CSP
Related CSPs:	1.02, 1.06, 1.07, 2.01	Daily Usage:	See each chemical system CSP
Related Process Flow Diagrams:	See each chemical system CSP	Maximum Shutdown Duration:	See each chemical system CSP
Task Description:	All improvements indicated for Area 76, including ferric chloride chemical system modifications, polymer dilution recycled water dilution piping reconfiguration, removal and installation of double wall piping and leak detection systems and other improvements in the drawings and contained in the specifications.		
Constraints	<ul style="list-style-type: none"> • See each chemical system CSP for individual system constraints • Polymer piping shutdowns will be limited to 24 hours. See CSP 1.06 and 1.07 for other applicable polymer system constraints. • All systems within Area 76 shall remain in operation unless approved otherwise 		
OWNER Role & Tasks:	<ul style="list-style-type: none"> • Continued operation of all Area 76 systems. • Modification to the DCS control system in coordination with the permanent improvements. Modifications by Owner will include: DCS programming, installation and removal of DCS equipment, and update of 		

Construction Sequencing Plan (CSP) 2.00: Centrifuge Building Improvements (Area 76)

DCS O&M manuals.

**CONTRACTOR
Role & Tasks:**

- See each chemical system CSP for specific roles and tasks.
- Perform all work required for this area in the drawings and specifications with complete systems meeting the intended improvements and proposed operations, including but not limited to:
 - Properly drain all residual chemicals from chemical systems per Section 01080.
 - Demolish all existing ferric chloride pumps, racks, and piping to the day tank flange.
 - Reconfigure polymer dilution piping.
 - Demolish and replace all overhead and vertical ferric chloride piping with double wall contained piping.
 - Install leak detection stations on new double walled ferric chloride piping.
- Attend proper safety meetings for the MBC facility.

**ENGINEER
Role & Tasks:**

- Review of CCSP and construction schedules.

Construction Sequencing Plan (CSP) 2.01: Ferric Chloride Feed System (Area 76)			
Location:	Area 76 Chemical Storage Room	Storage Tanks Operating / Available (Normal Conditions):	2 (76-T-21, 22)
General Operation:	System is currently offline (permanently)	Minimum Storage Tanks Operating (Improvement Work Condition):	0
		Pumps Operating / Available (Normal Conditions):	4 feed (76-P-72,73, 76, 77)
Related Control System:	Not applicable	Minimum Pumps Operating (Improvement Work Condition):	0
Related CSPs:	1.00, 1.05	Daily Usage:	Not applicable
Related Process Flow Diagrams:	76-D-8, 76-M-8	Maximum Shutdown Duration:	No limit
Task Description:	Ferric chloride feed system is no longer utilized. Storage tanks to be prepared for future storage use (of possible different chemicals).		
Constraints	<ul style="list-style-type: none"> Perform improvements prior to all other systems. As an option, the ferric chloride system improvements can be performed in the same time period as the sulfuric acid system improvements. Improvements cannot be performed concurrently with the sodium hypochlorite, sodium hydroxide or ferrous chloride system improvements. Improvements cannot be performed concurrently with any of the polymer system improvements. 		
OWNER Role & Tasks:	<ul style="list-style-type: none"> Continued operation of all adjacent chemical feed systems. Modification to the DCS control system in coordination with the permanent improvements. Modifications by Owner will include: DCS programming, installation and removal of DCS equipment, and update of 		

Construction Sequencing Plan (CSP) 2.01: Ferric Chloride Feed System (Area 76)	
	DCS O&M manuals.
CONTRACTOR Role & Tasks:	<ul style="list-style-type: none"> • Demolition and removal of pumps, pump supply piping, valves, actuators, meters and other appurtenances from storage tanks to feed connections. • Properly drain all residual chemicals from chemical systems per Section 01080. • Termination of wiring, conduits and appurtenances (power). • Termination of wiring and conduits (control). • Attend proper safety meetings for the MBC facility.
ENGINEER Role & Tasks:	<ul style="list-style-type: none"> • Review of CCSP and construction schedules.

Construction Sequencing Plan (CSP) 3.00: Digester Complex Improvements (Area 80)			
Location:	Area 80 Digester Complex and Ferrous Chloride Room	Storage Tanks Operating / Available (Normal Conditions):	See each chemical system CSP
General Operation:	Ferrous chloride chemical system receives chemical from Area 60 and feeds it into the digesters (1,2 and 3)	Minimum Storage Tanks Operating (Improvement Work Condition):	See each chemical system CSP
		Pumps Operating / Available (Normal Conditions):	See each chemical system CSP
Related Control System:	Section 13300 – Appendix A – CS16	Minimum Pumps Operating (Improvement Work Condition):	See each chemical system CSP
Related CSPs:	1.04, 3.01	Daily Usage:	See each chemical system CSP
Related Process Flow Diagrams:	See each chemical system CSP	Maximum Shutdown Duration:	See each chemical system CSP
Task Description:	Removal, replacement and reconfiguration of piping, materials and equipment for the ferrous chloride room and attached to the digesters. Associated electrical modifications		
Constraints	<ul style="list-style-type: none"> • See each chemical system CSP for individual system constraints 		
OWNER Role & Tasks:	<ul style="list-style-type: none"> • Continued operation of all adjacent chemical feed systems and digesters. • Modification to the DCS control system in coordination with the permanent improvements. Modifications by Owner will include: DCS programming, installation and removal of DCS equipment, and update of DCS O&M manuals. 		

Construction Sequencing Plan (CSP) 3.00: Digester Complex Improvements (Area 80)

**CONTRACTOR
Role & Tasks:**

- See each chemical system CSP for specific roles and tasks
- Perform all work required for this area in the drawings and specifications to provide complete systems meeting the intended improvements and proposed operations, including but not limited to:
 - Properly drain all residual chemicals from chemical systems per Section 01080.
 - Demolition and installation of new ferrous chloride feed system improvements within the ferrous chloride room.
 - Installation of double wall containment piping, valves, monitoring instruments and leak detection systems attached to the digesters
 - Relocation and installation of new electrical conduits, wiring and appurtenances as indicated
 - Relocation and installation of new control wiring and conduits as indicated
 - Preparation of loop drawings.
 - Assistance with DCS system cutovers and startups.
- Attend proper safety meetings for the MBC facility.

**ENGINEER
Role & Tasks:**

- Review of CCSP and construction schedules.

Construction Sequencing Plan (CSP) 3.01: Ferrous Chloride Feed System (Area 80)	
Location: Area 80 Ferrous Chloride Room	Storage Tanks Operating / Available (Normal Conditions): 2 (80-T-1, 2)
General Operation: Feeds ferrous to the digesters	Minimum Storage Tanks Operating (Improvement Work Condition): 1
	Pumps Operating / Available (Normal Conditions): 2 feed (current) / 3 feed (future) (80-P-80, 81 / 82)
Related Control System: Section 13300 – Appendix A – CS16	Minimum Pumps Operating (Improvement Work Condition): 1 feed
Related CSPs: 1.00, 1.04	Daily Usage: 500 to 600 gallons
Related Process Flow Diagrams: 80-D-3, 80-M-3	Maximum Shutdown Duration: 8 hours
Task Description:	Removal of existing piping, valves, actuators, flushing stations, meters, strainers and appurtenances in both the ferrous chloride room and attached to the digesters. Replacement with new piping, valves, actuators, flushing stations, meters, strainers and appurtenances to provide two supply pipelines from the storage tanks to the pumps and to account for the room reconfiguration. Replacement of new piping attached to the digesters with double wall containment piping and leak detection systems. Relocation of two existing feed pumps (80-P-80 & 81). Installation of one new feed pump (80-P-82).
Constraints	<ul style="list-style-type: none"> • Perform improvements after the sulfuric acid and ferric chloride system improvements are complete. • Perform improvements prior to any of the polymer system improvements. • Ferrous chloride feed system improvements can be performed concurrently with the sodium hypochlorite and sodium hydroxide system improvements. • Improvements must be performed prior to Area 60 ferrous chloride transfer system improvements. (Reason: Both Area 80 storage tanks must be online and available to perform Area 60 ferrous chloride

Construction Sequencing Plan (CSP) 3.01: Ferrous Chloride Feed System (Area 80)	
	<p>transfer system improvements).</p> <ul style="list-style-type: none"> • Improvements cannot be performed concurrently with the Area 60 ferrous chloride improvements. • Improvements cannot be performed concurrently with improvements to any of the polymer systems. • Pump 80-P-82 shall be installed and in operation prior to performing improvements associated with Pumps 80-P-80 and 80-P-81. • Piping penetrations (when pipe is removed) into the digesters shall be plugged (temporarily) until new piping is connected to avoid release of digester gas.
OWNER Role & Tasks:	<ul style="list-style-type: none"> • Continued operation of all adjacent chemical feed systems. • Assistance with equipment shutdown and isolation prior to performing improvements and making required connections. • Assistance during startup of the connected improvements to place system back online and in operation by Owner forces within the allowable shutdown duration. • Modification to the DCS control system in coordination with the permanent improvements. Modifications by Owner will include: DCS programming, installation and removal of DCS equipment, and update of DCS O&M manuals.
CONTRACTOR Role & Tasks:	<ul style="list-style-type: none"> • Demolition and removal of feed pump supply piping, valves, actuators, strainers, flushing stations and other appurtenances from storage tanks to feed pumps. • Demolition and removal of feed pump discharge piping, valves, actuators, sample and flushing stations, flow meters, and other appurtenances from feed pumps to the connection piping just outside ferrous chloride room. • Demolition and removal of piping, valves, actuators, and other appurtenances attached to the digesters. • Properly drain all residual chemicals from chemical systems per Section 01080. • Installation of new third feed pump (80-P-82). • Sequenced relocation of two existing feed pumps (80-P-81, 82). • Installation of piping, valves, actuators, monitoring instruments, flushing stations, strainers and appurtenances from storage tanks to the feed pumps. • Installation of piping, valves, actuators, monitoring instruments, flushing stations, meters, strainers and appurtenances from feed pumps to connection piping. • Installation of double wall containment piping, valves, monitoring instruments and leak detection systems attached to the digesters. • Relocation and installation of new wiring, conduits and appurtenances (power).

Construction Sequencing Plan (CSP) 3.01: Ferrous Chloride Feed System (Area 80)

- Relocation and installation of new wiring and conduits (control).
- Preparation of loop drawings.
- Assistance with DCS system cutovers and startups.
- Attend proper safety meetings for the MBC facility.

**ENGINEER
Role & Tasks:**

- Review of CCSP and construction schedules.

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Section 01610

GENERAL EQUIPMENT STIPULATIONS

1. SCOPE. When an equipment specification section in this Contract references this section, the equipment shall conform to the general stipulations set forth in this section, except as otherwise specified in other sections.
2. COORDINATION. Contractor shall coordinate all details of the equipment with other related parts of the Work, including verification that all structures, piping, wiring, and equipment components are compatible. Contractor shall be responsible for all structural and other alterations in the Work required to accommodate equipment differing in dimensions or other characteristics from that contemplated in the Drawings or Specifications.
3. MANUFACTURER'S EXPERIENCE. Unless specifically named in the Specifications, a 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.
4. WORKMANSHIP AND MATERIALS. Contractor shall guarantee all equipment against faulty or inadequate design, improper assembly or erection, defective workmanship or materials, and leakage, breakage, or other failure. Materials shall be suitable for service conditions.

All equipment shall be designed, fabricated, and assembled in accordance with recognized and acceptable engineering and shop practice. Individual parts shall be manufactured to standard sizes and thicknesses so that repair parts, furnished at any time, can be installed in the field. Like parts of duplicate units shall be interchangeable. Equipment shall not have been in service at any time prior to delivery, except as required by tests.

Except where otherwise specified, structural and miscellaneous fabricated steel used in equipment shall conform to AISC standards. All structural members shall be designed for shock or vibratory loads. Unless otherwise specified, all steel which will be submerged, all or in part, during normal operation of the equipment shall be at least 1/4 inch thick. When dissimilar metal components are used, consideration shall be given to prevention of galvanic corrosion.

5. STRUCTURAL DESIGN REQUIREMENTS. All equipment, including non-structural components and non-building structures as defined in ASCE 7, and

their anchorage, shall be designed and detailed in accordance with the Meteorological and Seismic Design Criteria section.

6. LUBRICATION. Equipment shall be adequately lubricated by systems which require attention no more frequently than weekly during continuous operation. Lubrication systems shall not require attention during startup or shutdown and shall not waste lubricants.

Lubricants of the types recommended by the equipment manufacturer shall be provided in sufficient quantities to fill all lubricant reservoirs and to replace all consumption during testing, startup, and operation prior to acceptance of equipment by Engineer. Lubricants for equipment where the lubricants may come in contact with water before or during a potable water treatment process or with potable water, shall be food grade lubricants. This includes lubricants for equipment not normally in contact with water, but where accidental leakage of the lubricants may contaminate the water.

Lubrication facilities shall be convenient and accessible. Oil drains and fill openings shall be easily accessible from the normal operating area or platform. Drains shall allow for convenient collection of waste oil in containers from the normal operating area or platform without removing the unit from its normal installed position.

7. ELEVATION. The elevation of the site shall be as indicated in the Meteorological and Seismic Design Criteria section. All equipment furnished shall be designed to meet stipulated conditions and to operate satisfactorily at the specified elevation.

8. ELECTRIC MOTORS. Unless otherwise specified, motors furnished with equipment shall meet the requirements specified in Common Motor Requirements for Process Equipment section or specified in specific equipment sections.

9. DRIVE UNITS. The nominal input horsepower rating of each gear or speed reducer shall be at least equal to the nameplate horsepower of the drive motor. Drive units shall be designed for 24 hour continuous service.

9.01. Gearmotors. The use of gearmotors sharing an integral housing or cutgears into the motor output shaft, or that require removal of lubricant from the gear reducer to change out the motor will not be acceptable.

9.02. Gear Reducers. Each gear reducer shall be a totally enclosed unit with oil or grease lubricated, rolling element, antifriction bearings throughout.

Unless superseded by individual specification requirements each helical, spiral bevel, combination bevel-helical, and worm gear reducers shall have a service factor of at least 1.50 based on the nameplate horsepower of the drive motor. Cycloidal gear reducers shall have a service factor of at least 2.0 based on the nameplate horsepower of the drive motor. Shaft-mounted and flange-mounted gear reducers shall be rated AGMA Class III. Helical gear reducers shall have a gear strength rating to catalog rating of 1.5. Each gear reducer shall be designed and manufactured in compliance with applicable most current AGMA standards, except the L₁₀ bearing life shall be 200, 000 hours.

The thermal horsepower rating of each unit shall equal or exceed the nameplate horsepower of the drive motor. During continuous operation, the maximum sump oil temperature shall not rise more than 100°F above the ambient air temperature in the vicinity of the unit and shall not exceed 200°F .

Each grease lubricated bearing shall be installed in a bearing housing designed to facilitate periodic regreasing of the bearing by means of a manually operated grease gun. Each bearing housing shall be designed to evenly distribute new grease, to properly dispose of old grease, and to prevent overgreasing of the bearing. The use of permanently sealed, grease lubricated bearings will not be acceptable in large sized reducers. In small reducers, similar to basin equipment, permanently sealed grease lubricated bearings rated L₁₀ 200,000 hour life may be provided at the manufacturer's option. An internal or external oil pump and appurtenances shall be provided if required to properly lubricate oil lubricated bearings. A dipstick or a sight glass arranged to permit visual inspection of lubricant level shall be provided on each unit.

Gear reducers which require the removal of parts or the periodic disassembly of the unit for cleaning and manual regreasing of bearings will not be acceptable.

Certification shall be furnished by the gear reducer manufacturer indicating that the intended application of each unit has been reviewed in detail by the manufacturer and that the unit provided is fully compatible with the conditions of installation and service.

9.03. Adjustable Speed Drives. Each mechanical adjustable speed drive shall have a service factor of at least 1.75 at maximum speed based on the nameplate horsepower of the drive motor. A spare belt shall be provided with each adjustable speed drive unit employing a belt for speed change. Unless specifically permitted by the detailed equipment specifications, bracket type mounting will not be acceptable for variable speed drives.

9.04. 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 1.75 at maximum speed based on the nameplate horsepower of the drive motor.

10. SAFETY GUARDS. All belt or chain drives, fan blades, couplings, and other moving or rotating parts shall be covered on all sides by a safety guard. Safety guards shall be fabricated from 16 USS gage thick or thicker galvanized, aluminum-clad sheet steel, or stainless sheet steel or from 1/2 inch mesh galvanized expanded metal, or pultrusion molded UV resistant materials. Each safety guard shall be reinforced or shaped to provide suitable strength to prevent vibration and deflection and shall comply with OSHA. Each guard shall be designed for easy installation and removal. All necessary supports and accessories shall be provided for each guard. Supports and accessories, including bolts, shall be galvanized. All safety guards in outdoor locations shall be designed to prevent the entrance of rain and dripping water.

11. ANCHOR BOLTS. Equipment suppliers shall furnish suitable anchor bolts for each item of equipment. Anchor bolts, together with templates or setting drawings, shall be delivered sufficiently early to permit setting the anchor bolts when the structural concrete is placed. Anchor bolt materials shall comply with the Anchorage in Concrete and Masonry section, and sleeves shall be provided as indicated on the drawings. Unless otherwise specified, anchor bolts shall be at least 3/4 inch in diameter.

Unless otherwise indicated or specified, anchor bolts for items of equipment mounted on baseplates shall be long enough to permit 1-1/2 inches of grout beneath the baseplate and to provide adequate anchorage into structural concrete.

12. EQUIPMENT BASES. Unless otherwise indicated or specified, all equipment shall be installed on concrete bases at least 6 inches high. Cast iron or welded steel baseplates shall be provided for pumps, compressors, and other equipment. Each unit and its drive assembly shall be supported on a single baseplate of neat design. Baseplates shall have pads for anchoring all components, and adequate grout holes. Baseplates for pumps shall have a means for collecting leakage and a threaded drain connection. Baseplates shall be anchored to the concrete base with suitable anchor bolts and the space beneath filled with grout as specified in the Grouting section.

13. SPECIAL TOOLS AND ACCESSORIES. Equipment requiring periodic repair and adjustment shall be furnished complete with all special tools, instruments, and accessories required for proper maintenance. Equipment requiring special devices for lifting or handling shall be furnished complete with those devices.

14. SHOP PAINTING. All iron and steel surfaces of the equipment shall be protected with suitable protective coatings applied in the shop. Surfaces of the equipment that will be inaccessible after assembly shall be protected for the life

of the equipment. Coatings shall be suitable for the environment where the equipment is installed. Exposed surfaces shall be finished, thoroughly cleaned, and filled as necessary to provide a smooth, uniform base for painting. Electric motors, speed reducers, starters, and other self-contained or enclosed components shall be shop primed or finished with an epoxy or polyurethane enamel or universal type primer suitable for top coating in the field with a universal primer and aliphatic polyurethane system.

Surfaces to be coated after installation shall be prepared for painting as recommended by the paint manufacturer for the intended service, and then shop painted with one or more coats of a universal primer.

Machined, polished, and nonferrous surfaces which are not to be painted shall be coated with rust-preventive compound as recommended by the equipment manufacturer.

15. PREPARATION FOR SHIPMENT. Equipment shall be prepared for shipment as specified in the Product Delivery Requirements section.

16. STORAGE. Handling and storage of equipment shall be as specified in the Product Storage and Handling Requirements section.

17. INSTALLATION AND OPERATION. Installation and operation shall be as specified in respective equipment sections and the Startup Requirements section.

18. OBSERVATION OF PERFORMANCE TESTS. Where the Specifications require the presence of Engineer, initial tests shall be observed or witnessed by Engineer. Owner shall be reimbursed by Contractor for all costs of subsequent visits by Engineer to witness or observe incomplete tests, retesting, or subsequent tests.

19. PROGRAMMING SOFTWARE. Programming software shall be provided for any equipment which includes a programmable logic controller (PLC) or other digital controller that is user-programmable. The software shall be suitable for loading and running on a laptop personal computer operating with a Windows-based operating system. A copy of the manufacturer's original operating logic program shall be provided for use in maintaining and troubleshooting the equipment. Where multiple pieces of equipment, from the same or different vendors, use the same programming software, only one copy of the software need be provided.

End of Section

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Section 01611

METEOROLOGICAL AND SEISMIC DESIGN CRITERIA

1. SCOPE. Buildings, non-structural components and non-building structures shall be designed in accordance with this section. In the event of conflict with requirements in other sections, the more stringent criteria shall be followed.

2. DESIGN CRITERIA. Non-structural components structures including anchorage of such items, shall be designed in accordance with the following criteria.

General Design Data:

Building code and references	IBC 2009, ASCE 7-05 "Minimum Design Loads for Buildings and Other Structures", AISC 360 "Specification for Structural Steel Buildings", AISC 341 "Seismic Provisions for Structural Steel Buildings"
Site elevation, above mean sea level	400 ft
Design flood elevation, DFE	N/A
Design groundwater elevation	N/A

Wind Design Data:

Basic wind speed, V (Service Loads)	85 mph
Exposure category	C
Importance factor, I_w (Occupancy Category III)	1.15

Design Data for Non-structural Components:

Design short period spectral response acceleration, S_{DS}	0.885 g
Site soil classification (Default Value)	D
Seismic Design Category	D
Component importance factor, I_p	As indicated in the Non-Structural Component Schedule

3. WIND ANCHORAGE. Equipment that is to be located outdoors shall have anchor bolts designed for the effects of wind forces, as determined in accordance with ASCE 7, Chapter 6. Shop drawings shall include full anchor bolt details, and

shall be sealed by a professional engineer licensed in the state of the project. Calculations shall be furnished when requested by Engineer.

4. SEISMIC DESIGN.

4-1. General. Structural systems shall provide continuous load paths, with adequate strength and stiffness to transfer all seismic forces from the point of application to the point of final resistance.

4-2. Pre-Engineered Buildings. Not used.

4-3. Non-Structural Components. Non-structural components are architectural, mechanical, and electrical items that are permanently attached to and supported by a structure but are not part of the structural system, as indicated in Chapter 13 of ASCE 7, and in the Non-Structural Components Schedule at the end of this section.

The Non-Structural Components Schedule identifies the components that require some level of seismic design. The requirements of this paragraph are applicable only to the items listed in the Non-Structural Components Schedule.

All components, and the anchorage of those components to the main structure, shall be shown on construction documents prepared and sealed by a registered design professional that is licensed in the state of the project. The construction documents shall be submitted in accordance with the Greenbook and Whitebook Submittals section. Structural calculations shall be submitted when requested by Engineer.

Design of non-structural components shall be in accordance with all applicable provisions of ASCE 7, Chapter 13. Non-structural components shall have sufficient strength and ductility to resist the specified seismic effects, and shall meet all of the design, proportioning, detailing, inspection, and quality assurance provisions of the specified building code and other referenced codes.

Non-structural components shall be attached so that seismic forces are transferred to the structural system. Curbs that support roof-mounted equipment shall be designed to transfer forces from the equipment into the main structural roof members. All structural attachments shall be bolted, welded, or otherwise positively fastened. Frictional resistance due to gravity shall not be considered in evaluating the required resistance to seismic forces.

When the Non-Structural Components Schedule indicates that seismic design of any component is required, the component shall be designed to be operable during and following a design level seismic event without collapsing, breaking away from supports, creating an ignition hazard, or releasing any contents.

"W_p" shall include the total operating weight of the component or system, including, but not limited to, any insulation, fluids, and concentrated loads such as valves, condensate traps, and similar components.

Seismic effects that shall be analyzed in the design of piping systems include the dynamic effects of the piping system, contents, and supports. The interaction between piping systems and the supporting structures, including other mechanical and electrical equipment, shall also be considered. Where pipe supports are to be designed by Contractor, as required by the Pipe Supports section, both the piping and support systems shall be designed to meet the applicable requirements of ASCE 7, Chapter 13.

4-4. Non-Building Structures. Not used.

End of Section

Non-Structural Component Schedule				
Component	Applicable Specification Section	Importance Factor (I_p)	Design of Supports and Attachments	Design of Component
Progressing Cavity Pumps	11160	1.0	x	
Piping Systems and Related Pipe Supports	15410	1.0	x	
Control Stations	16050	1.0	x	
Disconnect Switches	16050	1.0	x	
Common Motor Requirements for Process Equipment	16220	1.0	x	

Section 01612

PRODUCT DELIVERY REQUIREMENTS

1. SCOPE. This section covers packaging and shipping of materials and equipment.
2. PREPARATION FOR SHIPMENT. 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.

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 repainted to the satisfaction of Engineer.

Grease and lubricating oil shall be applied to all bearings and similar items.

3. SHIPPING. 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

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Section 01614

PRODUCT STORAGE AND HANDLING REQUIREMENTS

1. SCOPE. This section covers delivery, storage, and handling of materials and equipment.
2. DELIVERY. 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 sub-suppliers making direct shipments to the Site.

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.

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.

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.

3. STORAGE. Upon delivery, all equipment and materials shall immediately be stored and protected until installed in the Work.

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 hold breakage, chipping, cracking, and spalling to a minimum. 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.

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.

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.

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.

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.

Equipment and materials shall not show any pitting, rust, decay, or other deleterious effects of storage when installed in the Work.

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.

4. HANDLING. 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.

During handling, carbon steel constructed material including chains, straps, and forks on lifting equipment shall not directly contact any equipment or material constructed of stainless steel. It shall be the Contractor's responsibility to correct any carbon steel contamination of stainless steel.

End of Section

Section 01615

EQUIPMENT AND VALVE IDENTIFICATION

PART 1 – GENERAL

1-1. SCOPE. This section covers the furnishing and installation of nameplates and tags for identification of equipment, valves, panels, and instruments.

1-2. GENERAL. Except as otherwise specified in equipment, valve, and instrumentation sections, nameplates and tags shall be as specified herein. Nameplates or tags shall be provided for all equipment, valves, operator interfaces, control and electrical panels, cabinets, instruments, and instrument racks that have been named and/or tagged on the Drawings.

1-3. SUBMITTALS. Drawings and data shall be submitted in accordance with the requirements of the Greenbook and Whitebook Submittals section for each type of tag provided including materials, colors, sizes, letter sizes, and installation instructions.

PART 2 - PRODUCTS

2-1. EQUIPMENT NUMBER PLATES. All equipment tagged on the drawings, except for submerged equipment shall be provided with number plates bearing the equipment tag number identified on the Drawings. Number plates shall be bevelled, 1/8th inch thick laminated black phenolic plastic engraving stock with white core. Lettering on number plates shall be capitalized block letters 3/4 inch high. 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 attached with stainless steel panhead screws, rivets, or drive screws.

When a number plate cannot be installed due to the physical size, space, or mounting surface geometry of the equipment, the Contractor shall provide a 12 gauge stainless steel tag with engraved or imprinted equipment tag number. Lettering on tags shall be 1/4 inch high. Tags shall be rectangular with smooth edges, and shall be fastened to the equipment with stainless steel mechanical fasteners or with a stainless steel chain.

2-2. EQUIPMENT INFORMATION PLATES. Equipment shall be provided with engraved or stamped equipment information plates securely affixed with mechanical fasteners to the equipment in an accessible and visible location. Equipment information plates shall be in addition to the number plates specified. Equipment information 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 information plates listing the distributing agent only will not be acceptable.

2-3. VALVE AND GATE TAGS.

2-3.01. Temporary Tags. Each valve and gate with an identifying number indicated on the Drawings or listed in the valve or gate schedule, shall be tagged or marked in the factory with the identifying number.

2-3.02. Permanent Tags. All valves and gates, except buried or submerged valves, that have been assigned a number on the Drawings or in the valve or gate schedule, shall be provided with a permanent number plate. Tags shall be permanently attached to valves and gates with stainless steel mechanical fasteners or with stainless steel chains. Numerals shall be $\frac{3}{4}$ inch high and shall be black baked enamel on an anodized aluminum plate.

All buried valves shall be tagged with a brass plate cast into a 6-inch by 6 inch concrete pad at grade next to the valve box. The valve number shall be engraved in the brass plate with lettering and numerals at least 1 inch high.

2-4. PANEL NAMEPLATES. Nameplates shall be provided on the face of each panel and cabinet. Panel identification nameplates shall be mounted at the top of the panel shall include the panel descriptive name and tag number as indicated on the Drawings, in two or three lines of text. Lettering shall be $\frac{3}{4}$ inch high.

Nameplates for devices mounted on or in the panel shall be inscribed with the text as indicated on the Drawings. Where nameplate information is not indicated on the Drawings, inscriptions shall be in accordance with information in the supplier's submittal drawings as guided by information in the relevant specification section. Panel device nameplates shall have engraved letters $\frac{3}{16}$ inch high.

Nameplate material and size shall be as specified above for equipment number plates. Nameplates shall be secured to the panel with stainless steel panhead screws.

2-5. INSTRUMENT TAGS.

2-5.01. Temporary Tags. Where instruments are not provided with permanent tags furnished from the factory, instruments shall be tagged or marked in the factory with the instrument tag number indicated on the Drawings.

2-5.02. Permanent Tags. Instruments shall be tagged with the instrument tag number indicated on the Drawings. Tags shall be 12 gauge stainless steel with engraved or imprinted symbols. Lettering on tags shall be ¼ inch high. Tags shall be rectangular with smooth edges, and shall be fastened to the instrument with stainless steel mechanical fasteners or with a stainless steel chain.

PART 3 – EXECUTION

Not used.

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Section 01650

STARTUP REQUIREMENTS

1. **SCOPE.** This section includes the requirements for startup and testing all items of equipment and systems that form a part of this CONTRACT. The purpose of this section is to define the requirements for bringing individual equipment, systems, and facilities online and for proving proper operation and performance of that work. Contractor is required to develop, submit, and maintain detailed plans, including designation of management and staff, for these activities as specified herein. Additional requirements such as training are specified in other sections.

As the Metro Biosolids Center is an active, continuous operating facility, placement of improvements online in an expeditious manner is critical. Shutdown requirements and constraints for each chemical feed system are included in the Construction Sequencing Plans (CSP) guidelines in the Construction Sequencing section. The Contractor will perform startup checks and functional testing of the systems as specified prior to making connections to the existing system. Upon making a connection(s), functional acceptance testing (F.A.T.) will be performed by the Plant Personnel and supported by the Contractor as specified in this Section.

The startup and testing services referenced or specified herein include the following:

Startup checks – By Contractor
Functional testing – By Contractor
Functional acceptance testing – By Plant Personnel as part of standard plant operations once system is placed back online.
Contractor in standby mode to address failures.

- Pre-Startup Activities and Checks - Inspections, tests and other activities necessary to determine that equipment, systems and subsystems have been properly manufactured and installed. Pre-startup activities shall include an audit of all factory testing of equipment and compiling the results for comparison to startup testing.
- Functional Testing – Initial limited operation of equipment, to demonstrate capability of installed components to perform their intended functions, respond to controls, and safely interface with external systems, followed by operation of individual systems in manual and automatic mode to test full functionality of individual systems.

- Functional Acceptance Testing (for the MBC facility chemical feed systems only due to limited shutdown durations indicated in the CSP guidelines) - Operation of equipment and chemical feed systems by Owner's Plant Personnel, in conjunction with the Contractor, upon completion of final connections to place the chemical feed system online under normal plant operations. The F.A.T. shall demonstrate capability of installed components to perform their intended functions for the complete chemical feed system process.

2. GENERAL. The Contractor shall be responsible for and furnish all labor, materials, instruments, incidentals, and equipment required for startup and testing. Temporary facilities required to carry out the specified testing, including temporary pipe, pumps, and other appurtenances, shall be furnished and installed, and removed when no longer required for startup and testing. Refer to the Whitebook and Greenbook Responsibilities of the Contractor section for requirements concerning water and power for startup and testing. Chemicals required for startup and testing will be provided by the Owner. Contractor shall give the Owner and Engineer 45 days notice before chemicals are required except as otherwise specified herein. Wastewater, including treated or test water that cannot be delivered to the system for any reason, shall be disposed of at the expense of the Contractor, in a manner acceptable to the Engineer, and in accordance with all laws, regulations, and permits.

Startup and testing shall be conducted during normal working hours during the workweek of Monday through Friday, unless otherwise approved by the Engineer. Where continuous long-term testing is required, testing may continue over the weekends and holidays with prior approval from the Engineer and Plant Personnel.

The minimum constraints for startup and testing include the following:

Each chemical feed system in Area 60 must have the minimum number of storage tanks and pieces of feed equipment in operation at all times as identified in the CSP guidelines, unless approved otherwise by the Engineer.

The ferrous chloride chemical feed system in Area 80 must have the minimum number of storage tanks and pieces of feed equipment in operation at all times as identified in the CSP guidelines, unless approved otherwise by the Engineer.

The Contractor's startup manager shall be on site full time at least 30 days prior to any field startup and testing activities and shall remain on site until all startup and testing activities are complete.

3.01. Startup Manager. The Contractor's startup manager shall be a startup and testing expert with a minimum of 5 years of experience starting up equipment and systems of similar type, size, capacity, and complexity to the equipment and systems included in this Project. The startup manager shall have the necessary experience to fully understand all startup requirements, to manage the Contractor's resources providing the startup services, and to prepare all startup documentation, as specified. The startup manager's assigned duties and responsibilities are those specifically related to planning, supervising, and executing startup activities and shall include, but shall not be limited to the following:

Coordinating all testing and startup activities.

Preparing all startup and field testing plans, documentation, and forms.

Liaising between the Contractor, Engineer, and Plant Personnel for all startup and testing activities.

Developing a comprehensive schedule for all startup activities and providing regular schedule updates. The startup and testing schedule shall be incorporated into the Progress Schedule.

Scheduling and leading startup and testing planning meetings.

Conducting coordination meetings during startup and testing at least weekly.

Coordinating manufacturers' services and their certification of proper installation and/or operation of equipment as required by the Specifications.

Overseeing and administering all startup and testing activities, including either direct participation in the activities and/or oversight and monitoring of activities. It shall be the startup manager's responsibility to assure that all tests have been completed in accordance with accepted testing procedures.

Ensuring readiness for and coordinating maintenance, repair, and adjustment of equipment and systems during startup and testing.

Conducting or overseeing pre-test checks to ensure readiness for testing.

Verify all piping hydrostatic testing and flushing has been completed prior to field testing connected equipment.

Ensuring all testing equipment is in proper working order and has been calibrated to appropriate standards.

Developing safe work policies and procedures including lockout/tagout procedures and personal protective equipment policies, that will be followed during all field startup and testing activities. At a minimum the Contractor shall comply with OSHA and the Owner's established safety guidelines. It shall be the startup manager's responsibility to assure all safety procedures are followed at all times.

Reviewing and approving all equipment training sessions prior to submission to Engineer, to assure that the training is compliant with the requirements of the Specifications and includes all applicable operation, maintenance, safety, functional, performance, and startup and testing information.

Organizing teams made up of qualified representatives of Suppliers, Subcontractors, and others, as appropriate, to efficiently and expeditiously startup and test the equipment and systems installed and constructed under this CONTRACT. The objective of this program shall be to demonstrate to the Engineer and Owner that the structures, systems, and equipment constructed and installed under this CONTRACT meet all performance requirements and the facility is ready for operation as intended. In addition, the testing program shall produce baseline operating conditions for the Owner to use in a preventive maintenance program.

Ensuring the development and maintenance of records documenting all startup and testing activity. The records shall be organized by major process system into organized files/binders and turned over to the Engineer prior to applying for final payment. Testing records shall be accessible to the Engineer and Plant Personnel at all times to allow monitoring of the progress.

Ensuring the startup team is equipped and ready to make emergency repairs and adjustments to equipment installed and modified as part of the Project.

Scheduling and conducting a one day workshop with the Engineer and Plant Personnel to resolve submittal review comments to the Contractor's startup and testing plan submittal.

Notifying the Engineer and all respective equipment manufacturers at least 20 days prior to the date when each equipment system is scheduled for pre-startup activities and checks.

Organize International Electrical Testing Association (NETA) acceptance testing in accordance with the Electrical Equipment Installation section.

3.02. Startup Team. The startup team shall include the startup manager and all staff deemed necessary for successful completion of startup and testing. This will typically include Engineers, major equipment vendors, operators, and representatives from the Instrumentation and Control System Supplier. Additional trade representatives may be included as project requirements dictate.

3.03. Manufacturer's Field Services Representative. The manufacturers shall provide a technically qualified field-service representative for the installation, startup, and testing of equipment furnished, as specified in the equipment sections. The manufacturer shall submit qualifications and experience records for all key personnel to be involved in startup activities.

The manufacturer's field services representative shall be employed full-time in installation, startup, and testing of similar equipment and facilities and work directly for the manufacturer. The representative shall have conducted startup activities similar to those required herein on at least two other projects of similar complexity. The Engineer shall have the right to reject the manufacturer's field services representative at any time, for immediate replacement by the manufacturer, if the accepted qualifications are not representative of the actual experience or abilities of the representative, as determined by the Engineer.

4. SUBMITTALS. Contractor shall submit the following information in accordance with the requirements of the Greenbook and Whitebook Submittals section.

Startup manager's qualifications and past project experience including contact names, addresses, current telephone numbers and e-mail addresses of owner representatives that can be used to verify the accuracy of the information. Submittal shall be made at the preconstruction conference.

Manufacturers' field services representative's qualifications and past project experience including contact names, addresses, current telephone numbers and e-mail addresses that can be used to verify the accuracy of the information. Qualification submittals shall be made 3 weeks before the manufacturer's representative is scheduled to be on site.

Manufacturer's certification of proper installation of all equipment as specified in the equipment sections.

Equipment and system startup and testing plans and schedule in accordance with the requirements of this section. Startup manager shall coordinate with Subcontractors and include their information in the startup and testing plan.

Unless otherwise specified in the equipment sections, preliminary copies of field calibration results. Submittal shall be made prior to the start of each test for associated systems.

Daily logs.

5. STARTUP AND TESTING REQUIREMENTS.

5.01. Startup Checks. Prior to field testing of all equipment, the Contractor shall perform the following:

Inspect and clean equipment, devices, and connected piping so they are free of foreign material.

Lubricate equipment in accordance with manufacturer's instructions.

Turn rotating equipment by hand.

Open and close valves by hand and operate other devices to check for binding, interference, or improper functioning.

Test and commission related electrical system components in accordance with the requirements specified in the Electrical and the Common Motor Requirements For Process Equipment sections.

Calibrate all instruments associated with the equipment.

Check for proper rotation, adjustment, alignment, balancing, mechanical and electrical connections, and any other conditions that may damage or impair equipment from functioning properly.

Inspect and verify proper anchorage.

Obtain manufacturer's certification of proper installation where specified in the equipment sections.

All equipment shall be confirmed ready to test by the Engineer based on the following:

Acceptance of Contractor's startup and testing plan.

Notification in writing by the startup manager that each piece of equipment or system is ready for testing.

Verification by the Engineer that all lubricants, tools, maintenance equipment, spare parts and approved equipment operation and maintenance manuals have been furnished as specified.

Cleanliness of equipment, devices, and connected work.

Completion of work adjacent to or interfacing with equipment to be tested.

Confirmation of manufacturer's representative's availability to assist with testing, where specified, and fulfillment of all other manufacturers' responsibilities as specified.

Engineer's inspection of all related civil construction, mechanical, and electrical installations.

Confirmation of completion of testing of all adjacent piping, duct work and other affected WORK.

5.02. Functional Testing. All startup checks shall be completed prior to functional testing. Functional testing shall be in accordance with relevant standards and in accordance with instructions of the manufacturers.

Ancillary and/or temporary facilities necessary to recycle, control, or discharge water, air, chemical, or gas from facilities being tested, shall be operational.

Functional testing shall include the functional operation of each piece of equipment. All moving parts of equipment and machinery shall be tested and adjusted so that they move freely and function satisfactorily. Functional testing shall demonstrate correct operation of all hardwired interlocks and controls.

Functional testing of power actuated valves shall include at least 4 full open-close operations. Testing shall demonstrate the maximum number of operations per hour as recommended by the actuator manufacturer without overheating.

Once functional testing of individual pieces of equipment is completed, individual systems functional testing shall commence. Individual system functional testing shall include startup of the complete system of mechanical, electrical, and instrumentation and control equipment as a functional process system. Field inspection prior to startup as specified in the Instrumentation and Control section, other testing by the instrumentation and control system supplier required to verify

readiness for automatic operation of the individual system, shall be completed before commencement of individual system functional testing.

Individual system functional testing shall include operation in manual and automatic modes, startup operation, and shutdown in normal and emergency modes. Individual systems shall be tested over their entire operating range and for sufficient time to demonstrate the intended functionality of each piece of equipment and the system. If any part of a system shows evidence of unsatisfactory or improper operation during the test period, correction or repairs shall be made and the functional testing shall be repeated until satisfactory results are obtained.

Functional testing of all process and pumping equipment and drive motors, including auxiliary equipment, shall be in accordance with the appropriate and approved test codes, such as those specified by the American Society of Mechanical Engineers, Hydraulic Institute Standards, and IEEE.

Qualified personnel from the electrical and mechanical trades responsible for installation of the equipment shall be available during functional testing involving electrically operated equipment. Where appropriate, a representative of the instrumentation and control system supplier shall also be available.

5.03. Functional Acceptance Testing (F.A.T.). Upon completion of the Contractor's functional testing and associated documentation has been submitted and accepted by the Engineer, the Contractor shall make final connections to the existing operational chemical system. Upon connection, the Contractor shall assist the Plant Personnel to conduct F.A.T. of each complete process system by placing the improvements online under normal plant operations. The F.A.T. shall demonstrate individual systems meet the specified requirements. F.A.T. shall include the successful demonstration of all operating functions and conditions that are specified for the equipment, system, and controls. The Contractor shall provide staff "on-call" during the F.A.T. period who can be onsite at the MBC facility within two hours of a call from the Plant Personnel due to a system failure. The "on-call" status shall remain in effect for thirty days for each system as it is placed online. Equipment manufacturer's representative shall be on site during F.A.T. when specified in the equipment specifications.

The Contractor shall be responsible for preparing and coordinating with the Owner and Engineer in the preparation of documents for submission noted below to perform the F.A.T. The F.A.T. shall include the following submissions prior to commencement:

Prerequisite checklist, to be acknowledged by the Engineer and Plant Personnel prior to initiating the test, that demonstrates that all testing and other WORK required to be completed prior to the test is complete.

Listing of Plant Personnel necessary to operate the system and conduct any related monitoring of performance.

A listing of Contractor's personnel designated to supervise and direct the Plant Personnel as required herein.

A listing of Contractor's personnel available for "on-call" status as specified above.

Listing of standby personnel, equipment, and materials that will be available if needed during the test period.

Step-by-step procedures for operation of the facility showing how local and remote control of equipment will be demonstrated.

Description of all data and other information to be reported in support of the completed test. Include any blank data logs that may be used for recording results.

Descriptions of all necessary calculations that must be completed to verify the specified results are being achieved, including formulas.

Blank sign-off form for the test acknowledging the Contractor's, Engineer's, Plant Personnel's, and the equipment manufacturer's acceptance of the F.A.T.

Contractor shall provide Engineer 14 days notice prior to testing of any individual system.

Individual system F.A.T. shall continue for 7 days without interruption for each system, and all parts shall operate satisfactorily in all respects under a range of conditions to simulate the full operating range of the equipment or system. If there are multiple parallel components or trains, then the testing duration will be 7 days for each individual train.

If any part of a system shows evidence of unsatisfactory or improper operation during the testing period, correction or repairs shall be made and the test repeated until the test is successfully completed. Testing interrupted by power failure will not be required to be repeated, but the test shall be continued upon restoration of power and extended to the specified duration at no additional cost to the Owner.

During this F.A.T. period, the Plant Personnel shall operate all equipment.

6. STARTUP SCHEDULE AND STARTUP PLANS. Plans and schedules shall be developed to facilitate coordinated and efficient startup and testing of the Project equipment and systems.

The Contractor shall submit a startup and testing plan and schedule to the Engineer no later than 90 calendar days prior to the commencement of startup and testing. A minimum of 20 working days shall be allowed for review by Engineer. The schedule and plan must be accepted a minimum of 30 days prior to commencement of startup and testing. The schedule and plan shall include sections for startup checks, functional testing, and functional acceptance testing.

Forms for startup and testing shall include identification of equipment or system, startup/test date, nature of startup/test, startup/test objectives, startup/test prerequisites, startup/test results, instruments employed for the startup/test and signature spaces for the Engineer's witness (where applicable) and the Contractor's startup manager.

6.01 Startup Schedule. A startup schedule that provides an overall sequence and duration for all startup and testing activities shall be prepared and maintained. This schedule shall serve as a companion to but shall not be a replacement for the startup plan. The startup schedule described in this section shall be integrated into the overall construction schedule and shall be prepared as specified in the Greenbook. The startup schedule shall be updated weekly during the startup and testing period.

6.02. Startup Plan. The Startup Plan shall include the following:

Introduction with a narrative description of the overall testing and startup program. The description shall include all contractual or regulatory treatment requirements to be demonstrated.

A summary of the objectives and approach for startup checks, functional testing, and functional acceptance testing.

List of the instruments, equipment, and systems that will undergo startup and testing with references to the appropriate piping and instrumentation diagrams, equipment tags/identification numbers, Specification number and standards for testing procedures.

Schedule for startup and field testing for each instrument, piece of equipment (including redundant equipment), and system.

Safety and emergency response plan including a list of emergency and non-emergency contacts (email and phone).

Organization chart for Contractor's startup and testing personnel with assigned responsibilities for each.

Startup and testing record keeping plan.

Plan for reuse and disposal of water/wastewater from startup and testing, including information on any required regulatory permits/approvals.

Description of temporary facilities that will be provided.

List of chemicals to be provided by the Owner.

Within 7 to 14 days of initial submittal of the startup plan, the Contractor shall schedule a workshop with the Engineer and Plant Personnel to present the plan. The Contractor shall submit minutes of the workshop, including action items and a schedule for updating the startup plan, to the Engineer within 3 days of the workshop.

Individual plans for each phase of startup and testing can be assembled as chapters in the startup plan or submitted as individual documents but should be correlated to ensure there is not disagreement between chapters or separate documents.

6.02.01 Startup Checks Plan. The startup checks plan shall be subdivided into plans for each system and major component. Each system/major component plan shall include but not be limited to the following:

Identification of information for each component or piece of equipment to be inspected as part of the system. All applicable tag numbers shall be included.

Specific activities to be completed on each component, piece of equipment, or system as required to demonstrate proper installation and connection.

A tracking checklist of prerequisites for the checks and each step of the checking procedure, including any temporary facilities or utility requirements.

Listing of manufacturer's representative(s) to be on site during the check.

Sign off forms for the Contractor's startup manager.

6.02.02 Functional Testing and Functional Acceptance Testing Plans. The functional testing plan and F.A.T. plan shall include procedures and reporting for testing. The plans shall be subdivided into testing plans for each system. Each system test plan shall include but not be limited to the following:

A narrative description of the purpose and goals of the test for each component, piece of equipment, or system, which should include all activities (including those required by vendors/suppliers) necessary to verify proper equipment and system functionality.

Identification of each component or piece of equipment to be tested as part of the system. All applicable tag numbers shall be included.

Schedule and duration for the tests.

Prerequisites for each test, including any temporary facilities or utility requirements.

Pass/fail criteria for the test.

A checklist for tracking testing progress which includes prerequisites for the test and each step of the testing procedure. The check list shall include specified performance criteria that are to be met.

A description of test apparatus required to conduct the test.

Identification of all temporary facilities and chemicals required during startup.

Listing of manufacturer's representative(s) to be on site during the test.

Certificates of proper installation, as applicable to the test.

Step-by-step detailed procedure of the test. The level of detail shall be sufficient for a witness to be able to follow the steps during the test and be confident that the test is being performed as planned. All steps required to proceed through the test in an orderly manner are considered significant and each of these steps shall be included in the procedure.

Copies of the data recording forms that will be used during the test.

Calculation methodologies to be used to evaluate the data and/or test criteria for the test.

Sample computations or analyses for the test with results in the same format as the final report. This item is intended to demonstrate how data collected will be used to generate final results. A sample shall be included for each type of computation required for the test and analysis of results.

Blank sign-off forms for the test acknowledging the startup manager's, Engineer's, Plant Personnel, and equipment manufacturer's acceptance of the test where applicable.

7. REPORTS AND RECORDS. Records of all startup and testing shall be compiled by the Contractor and submitted to the Engineer. Prior to being submitted to the Engineer, the startup manager shall certify that the results recorded and the tested systems comply with the CONTRACT requirements. Records shall include all documentation assembled for each piece of equipment or system involved in the startup and testing, including all certifications, forms, and check lists completed during the startup and test, and sign-off forms.

Records of all startup and testing shall be compiled as separate documents for each system tested, and shall be submitted within 48 hours of completion of the startup and testing for each system. Testing samples that require analysis periods greater than 48 hours shall be clearly defined in the startup plan but shall not preclude delivery of the balance of the records within the 48 hour timeframe.

The Contractor shall provide formal reporting and documentation of failures, malfunctions or defects, and repairs made during the startup and/or testing activities. A "System Problem Report" form is included at the end of this section, and shall be used by the Contractor to document problems that arise during these tests and their resolution. Records submitted shall include "System Problem Report" forms completed during testing.

End of Section

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SYSTEM PROBLEM REPORT

Project Name: MBC Chemical Systems Improvements Phase II			
Test Name:			
Test Number:			
Problem Type: Hardware Software Documentation Unknown Other			
SYMPTOMS:	Time:	Date:	By:
Description:			
Can problem be reproduced at will? Y / N			
DIAGNOSIS:	Time:	Date:	By:
Description:			
CORRECTION:	Time:	Date:	By:
Description:			
FINAL SIGN OFF	Time:	Date:	By:

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Section 02050

DEMOLITION

PART 1 - GENERAL

1-1. SCOPE. This section covers the demolition of existing piping, equipment, and the salvage of existing equipment as indicated on the Drawings.

1-2. GENERAL. Contractor shall be responsible for all work under this section. Contractor shall provide 5 days written notice prior to beginning demolition activities.

All structures and facilities of the plant which are not to be completely removed, like sulfuric acid system in area 60, and ferric chloride feed system in area 76, must remain in continuous operation during the work. Demolition and salvage work shall create minimum interference with Owner's operations and minimum inconvenience to Owner. Contractor shall provide protection and safety of all roadways, sidewalks, and all accessible areas during demolition activities. See Construction Sequencing specification section 01080 for additional details.

Blasting will not be permitted.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

3-1. DEMOLITION. Removal of equipment or facilities shall include removal of all accessories, piping, wiring, supports, associated electrical starters and devices, baseplates and frames, and all other appurtenances, unless otherwise directed. Existing materials and equipment removed, and not indicated to be reused as a part of the Work, shall become Contractor's property unless otherwise specified, and shall be removed from the Site.

Contractor shall conduct demolition activities in a manner that prevents damage to existing facilities which are indicated to remain and shall provide all necessary protection for existing facilities. Any remaining facilities damaged during demolition shall be repaired by Contractor to a condition equal to or better than the original condition.

When demolition is complete, all debris shall be removed from the Site and the Site graded to the lines and grades indicated on the Drawings.

3-1.01. Structure Demolition. Not used.

3-1.02. Piping and Equipment Demolition. The following piping and equipment shall be removed and shall become the property of Contractor. All such items shall be promptly removed from the site.

Removal of existing chemical piping within the limits indicated in the drawings

Equipment as indicated on the drawings in areas 60, 76, and 80.

3-1.03. Sitework Demolition. Not used.

3-2. SALVAGE.

3-2.01. Items To Be Salvaged by Owner. Not used.

3-2.02. Items To Be Salvaged by Contractor. Removed and salvaged equipment or facilities shall include removal and salvage of all accessories, piping, wiring, supports, associated electrical starters and devices, baseplates and frames, and all other appurtenances, unless otherwise directed.

Existing materials and equipment removed, and not reused as a part of the work, shall become Contractor's property unless otherwise specified, and shall be removed from the jobsite.

The following items shall remain Owner's property and shall be delivered to Owner by Contractor in good condition at the delivery points indicated:

<u>Item</u>	<u>Location</u>	<u>Delivery Point</u>
All removed actuators	Area 60, 76, and 80	TBD

Contractor shall carefully remove, in a manner to prevent damage, all materials and equipment specified herein or indicated to be salvaged and to remain the property of Owner. Contractor shall store and protect salvaged items specified or indicated to be reused in the work. Any items damaged in removal, storage, or handling through carelessness or improper procedures shall be replaced by Contractor in kind with equal or higher quality items.

Contractor may, at his option, furnish and install new items of equal or higher quality instead of those specified or indicated to be salvaged and reused, in which case such removed items will become Contractor's property.

End of Section

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Section 03301

MISCELLANEOUS CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1-1. SCOPE. This section covers all cast-in-place concrete, including reinforcing steel, forms, finishing, curing, and appurtenant work. All concrete shall be air-entrained.

1-2. GENERAL. All cast-in-place concrete shall be accurately formed and properly placed and finished as indicated on the drawings and as specified herein.

1-3. SUBMITTALS. All submittals of drawings and data shall be in accordance with the Greenbook and Whitebook Submittals section.

1-4. STORAGE AND HANDLING. Cement shall be stored in suitable moisture proof enclosures. Cement which has become caked or lumpy shall not be used.

Aggregates shall be stored so that segregation and the inclusion of foreign materials are prevented. The bottom 6 inches of aggregate piles in contact with the ground shall not be used.

Reinforcing steel shall be carefully handled and shall be stored on supports that will prevent the steel from touching the ground.

PART 2 - PRODUCTS

2-1. LIMITING REQUIREMENTS. Unless otherwise specified, concrete shall be controlled within the limits identified in this Section.

2-1.01. Cement Content. The quantity of Portland cement in the concrete shall be not less than that indicated in the following table:

Quantity of Cement (lb/yd ³)			
Coarse Aggregate Size from No. 4 Sieve to			
3/8 in.	1/2 in.	3/4 in.	1 in.
600	580	560	535

2-1.02. Maximum Water-Cementitious Ratio. The maximum water-cementitious ratio shall be 0.45 for liquid containing structures and 0.42 for all other structures and slab on grade work based on a weight basis. If fly ash is used, the combined mass of cement plus fly ash shall be used to determine the water-cementitious materials ratio.

2-1.03. Fly Ash Content. At the option of Contractor, fly ash may be substituted for up to 25 percent of the Portland cement, but not less than 15 percent, on the basis of 1.0 lbs of fly ash added for each lb of cement reduction.

2-1.04. Coarse Aggregate. The maximum nominal coarse aggregate size shall be not larger than 1 inch.

2-1.05. Slump. Concrete slump shall be kept as low as possible consistent with proper handling and thorough compaction. Unless otherwise authorized by Engineer, slump of concrete without a superplasticizer shall not exceed 4 inches. Slump of concrete with a superplasticizer, or a midrange water reducer, shall not exceed 8 inches.

2-1.06. Total Air Content. The total volumetric air content of concrete after placement shall be 6 percent \pm 1.5 percent. Air-entraining admixture may be omitted from concrete for interior slabs which are to be trowel finished.

2-1.07. Admixtures. The admixture content, batching method, and time of introduction to the mix shall be in accordance with the manufacturer's recommendations and acceptable to Engineer. A water-reducing admixture and an air-entraining admixture shall be included in all concrete. A midrange water reducer or a superplasticizer may be used at Contractor's option. No calcium chloride or admixture containing chloride from sources other than impurities in admixture ingredients will be acceptable.

2-1.08. Strength. The minimum acceptable compressive strengths, as determined by ASTM C39, shall be:

Age	Minimum Compressive Strength
7 days	3,375 psi
28 days	4,500 psi

Cylinders shall be 6 inches diameter by 12 inches high. The average compressive strength shall be determined from the results of at least two cylinders. All tests shall be performed using the same sized cylinders for the duration of the work.

2-1.09. Concrete for Fill Shaping, Pipe Blocking and Pipe Encasement.

Concrete for fill shaping, buried blocking and encasement of pipe shall conform to the limiting requirements specified herein, except that the cement factor and total water content may be adjusted to provide a minimum compressive strength of 3,000 psi at 28 days. Concrete shall have a slump of not less than 2 inches nor more than 5 inches when placed.

2-2. MATERIALS.

Cement	ASTM C150, Type I or II , low alkali.
Fly Ash	ASTM C618, Class F, except loss on ignition shall not exceed 4 percent.
Fine Aggregate	Non-reactive, clean natural sand, ASTM C33. Artificial or manufactured sand will not be acceptable.
Coarse Aggregate	Non-reactive crushed rock, washed gravel, or other inert granular material conforming to ASTM C33, class 4S, except that clay and shale particles shall not exceed 1 percent.
Water	Potable.
Admixtures	
Water-Reducing	ASTM C494, Type A or D.
Air-Entraining	ASTM C260.
Superplasticizing	ASTM C494, Type F or G.
Reinforcing Steel	
Bars	ASTM A615, Grade 60, deformed.
Welded Wire Fabric	ASTM A185 or A497.
Bar Supports	CRSI Class 1, plastic protected; or Class 2, stainless steel protected.
Mechanical Connector (Couplers or Form Savers)	Classified Type 2 per ACI 318. Use only where indicated on the drawings.

PVC Waterstops	Extruded, virgin, elastomeric, polyvinyl chloride (PVC), white (no pigment), ribbed, 3/8 inch thick. Reclaimed material will not be acceptable. Provide hog rings or grommets spaced at 12 inches on center entire length.
At construction joints in concrete sections less than 12 inches in thickness	6 inches wide; Greenstreak "679" or Vinylex "R638".
At construction joints in concrete sections 12 inches or more in thickness	9 inches wide; Greenstreak "646" or Vinylex "R938".
Expandable Waterstops, permitted only at locations indicated on Drawings	Hydrophilic; bentonite free, chemically modified rubber. Adeka "Ultra Seal MC-2010MN" or Greenstreak "Hydrotite CJ-1020-2K". Adhesive as recommended by the manufacturer.
Sealant for expandable waterstop	Adeka "Ultra Seal P-201" or Greenstreak "Leakmaster".
Forms	
Plywood Product	Standard PS1, waterproof, resin-bonded, exterior type, Douglas fir.
Lumber	Straight, uniform width and thickness, and free from knots, offsets, holes, dents, and other surface defects.
Form Coating	Nonstaining and nontoxic after 30 days. Product shall not exceed Volatile Organic Compounds (VOC) limits established by the federal, state, or local regulatory agency having jurisdiction over the project site.
Evaporation Reducer	Dayton Superior "AquaFilm Concentrate J74", Euclid "Eucbar", L&M Chemical "E-Con", BASF "Confilm", or Sika "SikaFilm".

Polyethylene Film	Product Standard PS17 or ASTM D4397, 6 mils or thicker.
Vapor retarder and seam tape	Polyolefin membrane, 15 mil min, ASTM E1745, Class A, with maximum water vapor permeance of 0.02 perms. Stego Industries "Stego Wrap 15 Mil", Raven Industries "Vaporblock 15", Reef Industries "Griffolyn 15 Mil Green", W.R. Meadows "Perminator 15", Insulation Solutions "Viper VaporCheck II". Manufacturer recommended seam tape and pipe boots.
Membrane Curing Compound and Floor Sealer	ASTM C1315, Type I, Class A, minimum 25 percent solids, acrylic, non-yellowing, unit moisture loss 0.40 kg/m ² maximum in 72 hours. Product shall not exceed VOC limits established by the federal, state, or local regulatory agency having jurisdiction over the project site.
Epoxy Bonding Agent	ASTM C881, Type V, moisture insensitive, 100 percent solids; BASF "Concresive Paste LPL", Euclid "Euco #352" or "Euco #452", or Prime Resins "Prime Bond".

2-3. PRELIMINARY REVIEW. The source and quality of concrete materials and the concrete proportions proposed for the work shall be submitted to Engineer for review before concrete is placed.

2-4. FORMS. Forms shall be designed to produce hardened concrete having the shape, lines, and dimensions indicated on the drawings. Forms shall be substantial and sufficiently tight to prevent leakage of mortar and shall be maintained in proper position and accurate alignment.

Forms for pavement, curbs, or gutters shall be made of steel and shall be supported on compacted earth (95% compaction minimum). The top face of pavement forms shall not vary from a true plane more than 1/4 inch in 10 feet.

Forms shall be thoroughly cleaned and coated before concrete is placed.

2-4.01. Form Ties. Form ties shall be of the removable end, permanently embedded body type, and shall have sufficient strength and rigidity to support and maintain the form in proper position and alignment without the use of

auxiliary spreaders. Form ties for liquid-containing walls shall be provided with waterstop washers located on the permanently embedded portions of the ties at the approximate center of the wall. Through-wall tapered removable ties will not be acceptable for liquid-containing walls.

2-4.02. Edges and Corners. 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. Unless otherwise noted, bevels shall be 3/4 inch wide.

2-4.03. Form Removal. Forms shall not be removed or disturbed until the concrete has attained sufficient strength to safely support all dead, live, and construction loads. Care shall be taken in form removal to avoid surface gouging, corner or edge breakage, and other damage to the concrete.

2-5. REINFORCEMENT. Reinforcement shall be accurately formed and positioned and shall be maintained in proper position while the concrete is being placed and compacted. Unless otherwise indicated on the drawings, the details of fabrication shall conform to ACI 315 and 318. In case of conflict, ACI 318 shall govern. Reinforcement shall be free from dirt, loose rust, scale, and contaminants. Mechanical connections shall be used only as indicated on the drawings.

2-6. BATCHING AND MIXING. Concrete shall conform to ASTM C94 and shall be furnished by an acceptable ready-mixed concrete supplier.

2-6.01. 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.

2-6.02. 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 the concrete supplier, the project name, the mix 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

3-1. PLACEMENT. Contractor shall inform Engineer at least 24 hours in advance of the times and places at which he intends to place concrete.

Methods of conveying concrete to the point of final deposit and of placing shall prevent segregation or loss of ingredients. During and immediately after placement, concrete shall be thoroughly compacted and worked around all reinforcement and embedments and into the corners of the forms. Concrete shall be compacted by immersion-type vibrators, vibrating screeds, or other suitable mechanical compaction equipment. The use of "jitterbug" tampers to compact concrete flatwork will not be permitted.

3-1.01. Polyethylene Film. 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. Joints in the film shall be lapped at least 4 inches and taped.

3-2. WATER STOPS. Each water stop shall be continuous throughout the length of the joint in which it is installed. Water stops shall be clean, free from coatings, and shall be maintained in proper position until surrounding concrete has been deposited and compacted.

Junctions between adjacent sections of elastomeric (PVC) water stops shall be spliced in strict conformity with the recommendations of the manufacturer. Directional changes and intersections shall be factory fabricated by the water stop manufacturer prior to delivery to the site of the work. Field splices will be acceptable only in straight sections.

3-3. FINISHING. Recesses from form ties shall be filled flush with mortar. Fins and other surface projections shall be removed from all formed surfaces, except exterior surfaces that will be in contact with earth backfill.

Unless otherwise specified, unformed surfaces shall be screeded and 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 the completed finish for unformed surfaces unless indicated otherwise.

3-3.01. Troweling. Interior floor surfaces which will be exposed after construction is completed; exposed top surfaces of equipment bases and interior curbs; and other surfaces designated on the drawings shall be steel trowel finished. 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.

3-3.02. Application of Evaporation Reducer. Concrete flatwork subject to rapid evaporation due to hot weather, drying winds, and sunlight shall be protected with an evaporation reducer. The evaporation reducer shall form a continuous film on the surface of fresh, plastic concrete to reduce evaporation.

Immediately following screeding, evaporation reducer 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 the product 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 evaporation reducer may be required following each floating or troweling, except the last finishing operation.

3-4. CURING. Concrete shall be protected from loss of moisture by water saturation or by membrane curing 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.

Water saturation shall be used on liquid-containing concrete, and on concrete which will be covered later with mortar or additional concrete. Water saturation or membrane curing compound may be used on all other concrete surfaces.

Water saturation of concrete surfaces shall begin as soon as possible after initial set. Unformed surfaces shall be covered with polyethylene film, tarpaulins, or sand to retain the water. Water shall be applied as often as necessary to keep the concrete saturated for the entire curing period. Acceptable methods of water curing are described in ACI 308.1.

Membrane curing compound shall be sprayed at a coverage rate of not more than 300 square feet per gallon. Unformed surfaces shall be covered with curing compound within 30 minutes after final finishing. If forms are removed before the end of the specified curing period, curing compound shall be immediately applied to the formed surfaces. Curing compound shall be suitably protected against abrasion during the curing period.

Concrete shall be protected against freezing for at least 7 days after placement.

3-5. REPAIRING DEFECTIVE CONCRETE. Defects in concrete surfaces shall be repaired to the satisfaction of Engineer. All concrete which is honeycombed or otherwise defective shall be cut out and removed to sound concrete, with edges cut square to avoid feathering.

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 surrounding concrete. Repair work shall be adequately cured.

3-6. OWNER'S FIELD CONTROL TESTING. Field control tests shall be performed by Engineer or Owner's testing laboratory personnel, at the expense of Owner. Contractor shall provide access to all facilities and the services of one or more employees as necessary to assist with the field control testing.

3-6.01. Air Content. An air content test shall be made 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.

3-6.02. Slump. A slump test shall be made on concrete from each batch of concrete from which concrete compression test cylinders are made. Slump shall be determined in accordance with ASTM C143.

3-6.03. Test Cylinders. Compression test specimens shall be made, cured, stored, and delivered to the laboratory in accordance with ASTM C31 and C39. Compressive strength tests will be evaluated in accordance with ACI 318 and as specified herein.

One set of concrete test cylinders shall be cast for each concrete pour. A set of test cylinders shall consist of four or six cylinders depending on the cylinder size selected. Half of the cylinders shall be tested at 7 days, and the remaining half shall be tested at 28 days. All concrete required for testing shall be furnished by, and at the expense of, Contractor.

End of Section

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Section 03600

Grouting

PART 1 - GENERAL

1-1. SCOPE. This section covers procurement and installation of grout. Unless otherwise specified, only nonshrink grout shall be furnished.

Epoxy grouting of anchor bolts, threaded rod anchors, and reinforcing bars is covered in the anchorage in concrete and masonry section.

1-2. SUBMITTALS. 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 Greenbook and Whitebook Submittals section.

1-3. DELIVERY, STORAGE, AND HANDLING. 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

2-1. MATERIALS.

Nonshrink Grout	Precision cementitious grout with demonstrated non-shrinking properties; L&M "Crystex", BASF "Masterflow 713 Plus" or "Masterflow 928", Sika "SikaGrout 328", Hilti "CB-G PG Precision Grout", or Five Star Products "Five Star Grout".
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Water	Clean and free from deleterious substances.
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2-2. CEMENTITIOUS GROUT. Cementitious grout shall be furnished factory premixed so that only water is added at the jobsite.

2-3. EPOXY GROUT. Epoxy grout shall be used in lieu of cementitious grout when required by the equipment manufacturer for performance or warranty requirements. Epoxy grout products and installation procedures shall be submitted to Engineer for approval.

PART 3 - EXECUTION

3-1. PREPARATION. 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.

3-2. INSTALLATION.

3-2.01. Mixing. Grout shall be mixed in a mechanical mixer. The amount of water utilized shall be per the manufacturer's recommendation to produce a flowable grout.

3-2.02. 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.

3-2.03. 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.

3-2.04. 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 03930

CONCRETE CRACK REPAIR

PART 1 - GENERAL

1-1. SCOPE. This section covers the repair of concrete and joints.

1-1.01. General Crack Repair. General crack repair shall include the following:

- a. Sealing of all cracks and crack networks that are wider than 10 mils (0.01 inch) as measured at the exposed surface.
- b. All necessary repairs to structures that have failed a leakage test, including sealing of construction joints.

All costs for general crack repair shall be included in the Contract Price. General crack repair work is expected to be necessary on the Project due to cracks that commonly develop during concrete construction.

1-1.02. Engineer-Directed Crack Repair. Engineer-directed crack repair work shall only be performed when instructed by Engineer. The work shall include, but is not limited to, the following:

- a. Sealing of construction joints that are not otherwise required to be sealed as the result of a failure of a leakage test.
- b. Sealing of cracks and crack networks with a width of 10 mils (0.01 inch) or less as measured at the exposed surface.

Contractor shall include 150 linear feet of Engineer-directed crack repair in the Contract Price.

1-2. SUBMITTALS. Specifications and data covering physical properties, mixtures, application procedures, and curing procedures of the materials proposed shall be submitted in accordance with the Greenbook and Whitebook Submittals section. Submittals shall include the approvals from the material manufacturer.

1-3. QUALITY ASSURANCE.

1-3.01. Manufacturer's Field Services. The material manufacturer shall provide engineering field services to review the Project and the material application prior to any preparation; to approve the applicator, the material used, and the procedure to be used; to observe surface preparation; to approve surface preparation; and to observe application. The field representative of the material manufacturer shall submit, in writing through Contractor, approvals of proposed material, application procedures, applicator,

and surface preparation. The field representative shall be an employee of the material manufacturer.

1-3.02. Applicator. The applicator shall submit through Contractor a satisfactory experience record including references from previous application of the specified materials to structures of similar design and complexity.

1-3.03. Pre-Construction Meeting. At least 30 days prior to concrete crack repairs, Contractor shall conduct a meeting to review the detailed requirements for rehabilitation work. Site conditions, surface preparation, proposed equipment, procedures, material mixing, placing procedures, and curing methods shall be discussed and approved by Engineer and by the manufacturer's field representative. Contractor shall require the attendance of all involved parties, including but not limited to Contractor's superintendent, repair contractor, manufacturer's field representative and proposed equipment supplier representative. Minutes of the meeting shall be recorded, typed and printed by Contractor and distributed to all parties within 5 days after the meeting.

1-3.04. Quality Assurance Certification. Material manufacturers shall be ISO 9001/9002 registered or shall provide proof of documented quality assurance. The documented quality assurance system shall be obtained through an independent auditing registrar.

1-4. DELIVERY, STORAGE, AND HANDLING. Shipping shall be in accordance with the Product Delivery Requirements section. Handling and storage shall be in accordance with the Product Storage and Handling Requirements section.

PART 2 - PRODUCTS

2-1. PERFORMANCE AND DESIGN REQUIREMENTS. Unless otherwise specified or authorized, repairs shall conform to the requirements specified herein. Types of repairs not specified herein shall be as specified in other sections, as indicated on the Drawings, or, in the absence of any definite requirement, as recommended by the manufacturer's representative and subject to acceptance by Engineer. The following types of repairs shall be performed as required.

2-1.01. Pressure-Injected Epoxy Resin. Pressure-injected epoxy resin shall be used to seal cracks, construction joints, and other repairs in concrete and shotcrete structures as required or as directed by Engineer.

2-1.02. Pressure-Injected Foam Resin. Pressure-injected foam resin shall be used to seal joints and cracks in concrete and shotcrete structures that will have movement as required or as directed by Engineer.

2-1.03. Crack Sealant. Crack sealant shall be used to seal cracks in structures prior to pressure injection of resin.

2-2. ACCEPTABLE PRODUCTS. Repair products/materials shall be manufactured by the companies specified herein. Equivalent products of other manufacturers regularly producing high quality concrete crack repair products/materials, providing engineering field services, and meeting the specified quality assurance requirements may be furnished subject to review and acceptance by Engineer.

2-3. MATERIALS. All materials shall be as specified or as recommended by the manufacturer for temperature and moisture conditions encountered.

Pressure-Injected Epoxy Resin	ASTM C881, Type I or Type IV, moisture tolerant or moisture insensitive.
Pressure-Injected Foam Resin	Hydrophillic polyurethane foam; Prime Resins "Prime-Flex 900 XLV", DeNeef "HYDRO ACTIVE Sealfoam", or Avanti "AV-333 Injectaflex".
Foam Resin Accelerator	As recommended by foam resin manufacturer.
Crack Sealant	As recommended by the manufacturer of the pressure-injected epoxy resin product.
Water	Clean and free from deleterious substances.

PART 3 - EXECUTION

3-1. INSPECTION. Prior to the placement of the repair materials, the crack to be repaired shall be inspected by the Engineer to assure that preparation and conditions are correct for the type of repair and the product/material being used as specified herein.

3-2. PREPARATION. All cracks and surfaces around the cracks shall be free of objectionable substances and shall conform to the requirements of the material manufacturer. Concrete and shotcrete to be repaired shall be cleaned by methods acceptable to the material manufacturer so that the cracks are free of dirt, oil, grease, laitance, and other foreign matter. All loose and deteriorated existing concrete and shotcrete shall be removed down to sound materials. All concrete and shotcrete surfaces shall be checked for delamination to ensure that all surfaces are sound. All edges shall be square cut to avoid feather edges.

Any other preparation recommended by the material manufacturer shall be brought to Engineer's attention and may be incorporated into the work if acceptable to Engineer.

Concrete and shotcrete surfaces in the area of a crack to be repaired shall be cleaned by wire brushing, blasting, or other acceptable methods.

Wall surfaces shall be sandblasted clean to expose crack networks and construction joints. If there is active water seepage in the repair area, the seepage shall be stopped as recommended by the injection material manufacturer and as acceptable to Engineer. Injection ports shall be installed, when recommended by the injection material manufacturer.

3-2.01. Injected Epoxy Resin. Preparation for injected epoxy resin shall include sealing the surface at the crack on both sides, when possible, with crack sealant as recommended by the material manufacturer and as acceptable to Engineer for the pressure injection work. Injection ports for epoxy resin shall penetrate through the crack sealant into the cracks at spacings recommended by the material manufacturer.

3-2.02. Injected Foam Resin. Preparation for injected foam resin shall include drilling offset injection holes at an angle that will intersect the crack, joint, or crack network at approximately one-half the thickness of the concrete or shotcrete up to a thickness of 36 inches. Spacing of injection ports shall be determined as recommended by the injection material manufacturer and as acceptable to Engineer. When the injection material manufacturer certifies, in writing, that spacing of injection ports and installation procedures are acceptable, the injection ports may be installed directly into the crack, subject to review by Engineer.

3-3. APPLICATION. Concrete and shotcrete repair work shall be performed in accordance with the following requirements.

3-3.01. Crack Sealant. Crack sealant shall be trowel-applied to a minimum dried thickness of 1/8 inch. The concrete surface where the sealant is applied shall be smooth, uniform, and free from irregularities. Crack sealant shall be removed after the injection of resin is completed whenever the sealant will be visible after completion of the work.

3-3.02. Pressure-Injected Resin. The injected areas shall be prepared as specified and as recommended by the manufacturer. Pressure-injected resin shall be suitable for penetration of joints, cracks, and crack networks 2 mils (0.002 inch) wide and larger.

After the joints and cracks are prepared and before the injection of the resin, the joints shall be flushed with water. The water flush shall be terminated when the turbidity of the expelled water is equal to that of the flush water.

The pumping equipment used for the pressure injection of resin shall have pressure metering. Written procedures for use and quality control of the injection equipment shall be furnished to Engineer for review and acceptance. The pump shall be electric. The material and process used for the pressure injection of the resin shall have been in use a minimum of 5 years.

The joints and crack networks shall have a minimum of 90 percent penetration of resin into the joint or crack network. Core samples may be taken at Engineer's discretion.

3-3.02.01. Epoxy Resin. Epoxy resin shall be injected into the structure in accordance with the material manufacturer's recommendations and as acceptable to Engineer. Epoxy resin shall be injected until the resin appears at the next port.

3-3.02.02. Foam Resin. Foam resin shall be premixed and injected into the structure in accordance with the material manufacturer's recommendations and as acceptable to Engineer. Foam resin shall be injected into the structure until the resin appears at the next injection port.

Surfaces of cracks and joints may need to be sealed with crack sealant.

3-3.03. Cold Weather. When ambient temperatures below 40°F are expected during the curing period, the repair materials shall be maintained at a temperature of at least 50°F for 14 days or 75°F for 7 days after placement. Sudden cooling of the repair materials shall not be permitted.

3-4. PROTECTION. Post-placement curing and protection shall be as specified herein and in accordance with the manufacturer's recommendations.

3-5. CLEANING. Work areas shall be cleaned each day and shall be in accordance with the Green and Whitebook Work Site Maintenance section. Upon completion of the final cleanup, Contractor shall restore all areas affected by the grouting procedures to their original condition, leaving no trace of material piles or other wasted materials.

End of Section

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SECTION 05120

STRUCTURAL STEEL

PART 1 - GENERAL

1-1. DESCRIPTION OF WORK

1-1.01. This Section describes the requirements for furnishing and installing structural steel.

1-1.02. Materials and fabrication procedures are subject to inspection and tests in mill, shop, and field, conducted by a qualified inspection agency. Promptly remove and replace materials or fabrications which do not comply.

1-1.03. Design of Members and Connections: Details are typical; similar details apply to similar conditions, unless otherwise indicated. Verify dimensions at site whenever possible without causing delay in the work. Notify Engineer whenever design of members and connections are not clearly indicated.

1-2. SUBMITTALS Complete data and drawings shall be submitted per the Greenbook and Whitebook Submittals section.

1-2.01. Shop Drawings. Furnish shop drawings including complete details for fabrication and assembly of structural steel members, procedures and diagrams.

1-2.01.01. Include details of cuts, connections, camber, holes, and other pertinent data. Indicate welds by standard American Welding Society (AWS) symbols, and show size, length, and type of each weld.

1-2.01.02. Furnish setting diagrams, templates, and directions for installation of anchor bolts and other anchorages to be installed as work of other Sections.

1-2.01.03. Prepare erection drawings with sequencing in compliance with all current OSHA requirements.

1-2.01.04. Test Reports: Furnish copies of test reports conducted on shop and field bolted and welded connections. Include data on types of tests conducted and test results.

1-3. QUALITY ASSURANCE

1-3.01. Welding Qualifications: Prior to commencing welding, welding procedures, welding operations, all welders shall be qualified in accordance with AWS D1.1.

1-3.02. Codes: All work shall be executed in accordance with Chapter 22 of the "California Building Code" (CBC), current edition.

1-4. DELIVERY, STORAGE AND HANDLING

1-4.01. Deliver materials to site at intervals to ensure uninterrupted progress of the work.

1-4.02. Deliver anchor bolts and anchorage devices, which are to be embedded in cast-in-place concrete.

1-4.03. Store materials to permit easy access for inspection and identification.

1-4.03.01. Keep structural steel members off ground, using pallets, platforms, or other supports.

1-4.03.02. Protect steel members and packaged materials from erosion and deterioration.

1-4.03.03. Do not store materials on structure in a manner to cause distortion or damage to members or supporting structures.

1-4.03.04. Do not walk on or otherwise load existing roof panels.

PART 2 - PRODUCTS

2-1. MATERIALS

2-1.01. General: For fabrication of work which will be exposed to view, comply with AISC AESS (Architecturally Exposed Structural Steel) Category 2 and use only materials which are smooth and free of surface blemishes including pitting, rust and scale, seam marks, roller marks, rolled trade names, and roughness. Remove blemishes by grinding or by welding and grinding, prior to cleaning, treating, and application of surface finishes.

- 2-1.02. Structural Steel Shapes: ASTM A992, Grade 50.
- 2-1.03. Structural Steel Plates, Channels and Angles: ASTM A36, $F_y=36$ ksi.
- 2-1.04. Cold-Formed Steel Tubing: ASTM A500, Grade B.
- 2-1.05. Hot-Formed Steel Tubing: ASTM A501.
- 2-1.06. Steel Pipe: ASTM A53, Type E or S, Grade B; or ASTM A501.
- 2-1.06.01. Finish: Galvanized.
- 2-1.07. Unfinished Threaded Fasteners: ASTM A307, Grade A, regular low carbon steel bolts and nuts. Provide hexagonal heads and nuts for all connections unless otherwise indicated.
- 2-1.08. Drilled in Anchors, Adhesive Anchors and Threaded Rods: Stainless steel per ICC Report.
- 2-1.9. High Strength Threaded Fasteners: Heavy hexagonal structural bolts, heavy hexagon nuts, and hardened washers. Provide quenched and tempered medium-carbon steel bolts, nuts, and washers, complying with ASTM A325.
- 2-1.10. Welding Electrodes: Comply with AWS Code. AWS Code E70XX min.
- 2-1.11. Structural Steel Primer Paint: VOC complaint rust-inhibitive primer; Tnemec Series 18 Enviro-Prime or approved equal acrylic emulsion primer.
- 2-1.12. Cement Grout: Portland cement, ASTM C150, Type I or II, and clean, Uniformly graded, natural sanded, ASTM C404, Size No. 2. Mix at a ratio of 1 part cement to 3 parts sand, by volume, with minimum water required for placement and hydration.
- 2-1.13. Metallic Shrinkage-Resistant Grout: premixed factory-packaged ferrous aggregate grouting compound; Euclid Chemical Co. "Firmix", L&M Construction Chemicals, Inc. "Ferrogout", Master Builders "Embeco 885", Sonneborn/Rexnord "Ferrolith G" or approved equal.
- 2-1.14. Nonmetallic Shrinkage-Resistant Grout: Premixed, nonmetallic, noncorrosive, nonstaining product containing selected silica sands, Portland cement, shrinkage compensating agents, plasticizing and water-reducing agents; Euclid Chemical Co. "Euco N.S.", L&M Construction chemicals, Inc. "Crystex", Master Builders "Masterflow 713" or approved equal.

2-2. FABRICATION

2-2.01. Shop Fabrication and Assembly:

2-2.01.01. Fabricate and assemble in shop where possible.

2-2.01.02. Fabricate items in accordance with AISC Specifications and as indicated on file shop drawings.

2-2.01.03. Provide camber in structural members where indicated.

2-2.01.04. Mark and match-mark materials for field assembly.

2-2.01.05. Fabricate for delivery sequence, which will expedite erection and minimize field handling.

2-2.01.06 Where shop priming is required, complete assembly, including welding, before start of finishing operations. Provide finish surfaces of members exposed-to-view which are free of markings, butts and other defects.

2-2.02. Connections: Weld or bolt shop connections as indicated

2-2.02.01. Bolt field connections, except where welded connections or other connections are indicated.

2-2.02.02. Provide high-strength threaded fasteners for all bolted connections, unless unfinished bolts are indicated.

2-2.02.03. Provide unfinished threaded fasteners for temporary bracing to facilitate erection.

2-2.02.04. High-strength Bolted Connections: Install in accordance with AISC "Specifications for Structural Joints Using ASTM A325 or A490 Bolts", (RCRBSJ).

2-2.03. Welded Construction: Comply with AWS Code for procedures, appearance, and quality of welds and methods. Assemble and weld built-up sections by methods, which will produce true alignment of axes without warp.

2-2.04. Holes for Other Work: Provide holes required for securing other work to structural steel framing and for passage of other work through framing members as indicated on final shop drawings.

2-2.04.01. Punch, drill, or cut holes perpendicular to metal surfaces.

2-2.04.02. Do not flame cut holes or enlarge holes by burning.

2-2.04.03. Drill holes in bearing plates.

2-3. SHOP PAINTING

2-3.01. General: Shop paint structural steel, except members to be galvanized.

2-3.02. Surface Preparation: After inspection and after shipping, clean steel to be painted. Remove loose rust, loose mill scale, and spatter, slag or flux deposits. Clean steel to be field-painted in accordance with SSPC SP-6.

2-3.03. Painting: Immediately after surface preparation, apply primer at dry film thickness of not less than 1.5 mils, in accordance with manufacturers instructions. Use painting methods which result in full coverage of joints, corners edges and exposed surfaces.

PART 3 - EXECUTION

3-1. ERECTION

3-1.01. Surveys: Check elevations of concrete bearing surfaces, and location of anchor bolts and similar devices, before erection proceeds. Do not proceed with erection until corrections have been made.

3-1.02. Temporary Shoring and Bracing: Provide temporary shoring and bracing members with connections of sufficient strength to bear imposed loads. Remove temporary members and connections when permanent members are in place and final connections are made.

3-1.03. Setting Bases and Bearing Plates:

3-1.03.01. Clean concrete bearing surfaces of bond-reducing materials and roughen to improve surface bond.

3-1.03.02. Clean bottom surfaces of base and bearing plates.

3-1.03.03. Set loose and attached base plates and bearing plates for structural members on wedges or other adjusting devices.

3-1.03.04. Tighten anchor bolts after supported members have been positioned and plumbed. Do not remove wedges or shims; cut off flush with edge of base or bearing plate prior to packing with grout.

3-1.03.05. Pack grout solidly between bearing surfaces and bases or plates filling voids. Finish exposed surfaces, protect installed materials, and allow to dry.

3-1.04. Field Assembly

3-1.04.01. Set structural frames to lines and elevations indicated. Align and adjust members before permanently fastening.

3-1.04.02. Clean bearing surfaces and other surfaces which will be in permanent contact before assembly.

3-1.04.03. Adjust for discrepancies in elevations and alignment.

3-1.04.04. Level and plumb individual members within specified AISC tolerances. Establish measurements on mean operating temperature of structure. Make allowances for differences between temperature at time of erection and mean temperature of structure when completed.

3-1.04.05. Erection Bolts: Remove erection bolts on exposed welded construction. Fill holes with plug welds and grind smooth.

3-1.04.06. Comply with AISC Specifications for bearing, adequacy of temporary connections, alignment, and removal of paint on surfaces adjacent to field welds.

3-1.04.07. Do not enlarge unfair holes in members by burning or by use of drift pins. Ream holes requiring enlargement to admit bolts.

3-1.05. Touch-Up Galvanization

3-1.05.01. Clean field welds and abraded areas of galvanization.

3-1.05.02. Apply zinc rich paint by brush to exposed areas.

3-2. FIELD QUALITY CONTROL

3-2.01. The Owner's Testing Laboratory will:

3-2.01.01. Review certificates of compliance.

3-2.01.02. Inspect high strength bolted connections as required by CBC Section 1701.5.6.

3-2.01.03. Visually inspect all welding while operators are making welds and after work is completed as required by CBC Section 1701.5.5.

3-2.01.04. Non-destructive test all complete penetration groove welds larger than 3/8 inches by ultrasonic or radiographic methods for conformance with the weld quality and standard of acceptance of AWS D1.1 for welds subject to tensile stress.

End of Section

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SECTION 05500

METAL FABRICATION

PART 1 - GENERAL

1-1. RELATED DOCUMENTS

1-1.01. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section as fully as if repeated herein.

1-2. DESCRIPTION OF WORK

1-2.01. Definition: Metal fabrications include items made from iron, steel, and aluminum shapes, plates, bars, strips, tubes, pipes, grating and castings which are not a part of structural steel or other metal systems specified elsewhere.

1-2.02. The works includes the furnishing and installing of all miscellaneous metal work and related connections complete as indicated on the drawings and as specified.

1-2.03. Structural steel is specified in another section within Division 5.

1-3. CODES AND STANDARDS:

1-3.01. The editions referenced herein of Federal Specifications (Fed. Spec.) and of the other standards and specifications published by the following organizations, apply to the work only to the extent specified by the reference.

1-3.01.01. American National Standards Institute (ANSI)

1-3.01.02. American Institute of Steel Construction (AISC)

1-3.01.03. American Society for Testing and Materials (ASTM)

1-3.01.04. American Welding Society (AWS)

1-3.01.05. "California Building Code" (CBC), current edition

1-4. QUALITY ASSURANCE:

1-4.01. Shop Assembly: Preassemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for

shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

1-5. SUBMITTALS

1-5.01. Submittal procedures and quantities are as specified in the Greenbook and Whitebook Submittals section.

1-5.02. Product Data: Submit manufacturer's specifications, anchor details and installation instructions for products used in miscellaneous metal fabrications, including paint products and grout.

1-5.03. Shop Drawings:

1-5.03.01. Submit fully detailed shop drawings of all miscellaneous metal work giving sizes; details of fabrication and construction; methods of assembly and bracing; and locations of hardware, anchors, and all accessories.

1-5.03.02. Drawings shall include all shop and fabrication details, including cuts, copes, connections, holes, bolts and welds. All welds, both shop and field, shall be indicated by standard welding symbols in AWS D1.1. Drawings shall show the size, length and type of each weld. All materials to be brazed or soldered shall have connections indicated by symbols which are industry standards.

1-5.03.03. Contractors shall be responsible for all fabrication and for correct fitting of metal members. No material shall be fabricated or delivered to the site until the shop drawings have been reviewed by the Engineer and returned to the Contractor.

1-6. FIELD MEASUREMENTS AND TEMPLATES

1-6.01. Secure all field measurements required for proper and adequate fabrication and installation of the work. Furnish templates for exact location of items to be embedded in concrete and setting instructions required for all installation work.

1-7. DELIVERY AND STORAGE OF MATERIALS

1-7.01. Deliver material in time to ensure uninterrupted progress of the work. Materials shall be stored in a manner to preclude damage and permit ready access for inspection and identification of each shipment. Steel materials, either plain or fabricated, shall be stored above the ground upon platforms, pallets, skids, or other supports. Materials shall be kept free from dirt, grease, and other

foreign matter, and shall be protected from corrosion. Material showing evidence of damage will be rejected and shall be immediately removed from the work.

PART 2 - PRODUCTS

2-1. MATERIALS

2-1.01. Ferrous Metals:

2-1.01.01. Steel Plates, Shapes and Bars: ASTM A36.

2-1.01.02. Steel Tubing: Cold formed, ASTM A 500, Grade B.

2-1.01.03. Structural Steel Sheet: Hot-rolled, ASTM A 570; or cold-rolled ASTM A 611, Class 1; of grade required for design loading.

2-1.01.04. Aluminum Pipe: Handrail/guardrail of type, grade and weight to match existing and as required for design loading.

2-1.01.05. Brackets, Flanges and Anchors: Cast or formed metal of the same type material and finish as supported rails, unless otherwise indicated.

2-1.01.06. Fasteners: Provide stainless steel fasteners for exterior use or where built into exterior walls as noted on plans.

2-1.02. Electrodes: All arc welding electrodes shall conform to AWS A5.1 or A5.5 E70XX.

2-1.03. Galvanizing: Zinc coating shall conform to ASTM A123. Zinc coating for threaded products shall conform to ASTM A153. Treatment for damaged galvanized surfaces shall be Galvaloy, Galvicon or Drygalv, or equal.

2-1.04. Concrete Inserts: Threaded or wedge type per ICC report, stainless steel.

2-2. FABRICATION - GENERAL

2-2.01. Workmanship: Use materials of size and thickness indicated or, if not indicated, as required to produce strength and durability in finished product for use intended. Work to dimensions indicated or accepted on shop drawings, using proven details of fabrication and support. Use type of materials indicated or specified for various components of work.

2-2.02. Galvanizing: Provide a zinc coating for those items indicated or specified to be galvanized, as follows:

2-2.02.01. ASTM A 153 for galvanizing iron and steel hardware.

2-2.02.02. ASTM A 123 for galvanizing rolled, pressed and forged steel shapes, plates, bars and strip 1/8" thick and heavier.

2-2.02.03. ASTM A 386 for galvanizing assembled steel products.

2-3. MISCELLANEOUS FRAMING AND SUPPORTS

2-3.01. Provide miscellaneous steel framing and supports, which are not a part of structural steel framework, as required to complete work.

2-3.02. Fabricate miscellaneous units to sizes, shapes and profiles indicated or, if not indicated, of required dimensions to receive adjacent other work to be retained by framing. Except as otherwise indicated, fabricate from structural steel shapes, plates and steel bars, of welded construction using mitered joints for field connection. Cut, drill and tap units to receive hardware and similar items.

2-4. MISCELLANEOUS STEEL TRIM

2-4.01. Provide shapes and sizes for profiles shown. Unless otherwise indicated, fabricate units from structural steel shapes, plates and steel bars, with continuously welded joints and smooth exposed edges. Use concealed field splices wherever possible. Provide cutouts, fittings, and anchorages as required for coordination of assembly and installation with other work. Galvanize miscellaneous steel trim where indicated.

PART 3 - EXECUTION

3-1. PREPARATION

3-1.01. Field Measurements: Take field measurements prior to preparation of shop drawings and fabrication, where possible. Do not delay job progress; allow for trimming and fitting where taking field measurements before fabrication might delay work.

3-2. INSTALLATION

3-2.01. General:

3-2.01.01. Miscellaneous metal items shall be installed as rapidly as the progress of other work will permit. Splices and field connections shall be made with bolts, except where welding or brazing is indicated or approved on the shop drawings. Fasteners shall be installed as hereinafter. Metal work shall be set accurately at the established lines and levels. Installation shall be in strict accordance with approved shop drawings and actual conditions, true and horizontal or perpendicular as the case may be, level and square with angles and edges parallel with related lines of the building.

3-2.01.02. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing miscellaneous metal fabrications to in-place construction; including threaded fasteners for concrete, through-bolts, and other connectors as required.

3-2.01.03. Cutting, Fitting and Placement: Perform cutting, drilling and fitting required for installation of miscellaneous metal work accurately in location, alignment and elevation, plumb, level, true and free of rack, measured from established lines and levels.

3-2.01.04. Fit exposed connections accurately together to form tight hairline joints. Joints which cannot be shop welded because of shipping size limitations, shall be welded in the field to eliminate exposed joints. Grind all welds and exposed joints smooth and touch-up with Galvaloy or equal. Do not weld, cut or abrade the surfaces of exterior units which have been hot-dip galvanized after fabrication, and are intended for bolted or screwed field connections.

3-2.01.05. After assembly, the various members forming parts of a completed frame shall be aligned and adjusted accurately before being fastened. Tolerances shall conform to the applicable requirements of AISC "Code of Standard Practice". Contact shall be cleaned before the members are assembled. Poor matching of holes shall be corrected by drilling to the next larger size.

3-2.02. Field Welding: Comply with AWS Code for procedures of manual shielded metal-arc welding, appearance and quality of welds made, and methods used in correcting welding work.

3-2.03. Setting Loose Plates: Clean concrete bearing surfaces of any bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of bearing plates.

3-2.03.01. Set loose leveling and bearing plates on wedges, or other adjustable devices. After the bearing members have been positioned and plumbed, tighten

the fasteners. Do not remove wedges or shims, but if protruding, cut-off flush with the edge of the bearing plate before packing with grout. Use metallic non-shrink grout in concealed locations where not exposed to moisture; use non-metallic non-shrink grout in exposed locations, unless otherwise indicated.

3-2.03.02. Pack grout solidly between bearing surfaces and templates to ensure that no voids remain. See structural drawings for grout strength.

3-2.04. Touch up all damaged galvanized finishes due to installation, welding, threading or other work with treatment specified herein.

End of Section

Section 05550

ANCHORAGE IN CONCRETE AND MASONRY

PART 1 - GENERAL

1-1. SCOPE. This section covers the procurement and installation of anchors in concrete and masonry. It includes cast-in-place anchor bolts and anchor rods, adhesive anchors for both threaded rods and reinforcing bars, expansion anchors, and undercut anchors.

1-2. GENERAL. Unless otherwise specified or indicated on the Drawings all anchors shall be cast-in-place anchor bolts or anchor rods, with forged heads or embedded nuts and washers. Unless otherwise indicated, anchors in concrete shall have a diameter of at least 3/4 inch , and anchors in masonry shall have a diameter of at least 1/2 inch .

Unless otherwise indicated on the Drawings, anchors used in the following locations and applications shall be of the indicated materials. Anchors in other locations and applications shall be as indicated on the Drawings.

Cast-In-Place Anchor Bolts and Anchor Rods

Submerged locations	Stainless steel.
Locations subject to splashing	Stainless steel.
Buried locations	Stainless steel.
Anchorage of structural steel columns	Galvanized steel.
Other exterior locations	Galvanized 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.

Adhesive, expansion, and undercut anchors may be used instead of cast-in-place anchors only where specifically indicated or permitted on the Drawings or with the specific acceptance by Engineer.

1-3. SUBMITTALS. Data, catalog cuts, and International Code Council Evaluation Service (ICC-ES) reports indicating the manufacturer and types of adhesive anchors, expansion anchors, and undercut anchors to be supplied shall be submitted in accordance with the Greenbook and Whitebook Submittals section.

If Contractor requests use of products other than those indicated herein, calculations prepared by a registered professional engineer using methods and procedures required by the building code may be required as part of the submittal package.

1-4. DELIVERY, STORAGE, AND HANDLING. 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

2-1. MATERIALS. Unless otherwise indicated on the drawings, materials shall be as indicated below.

Cast-In-Place Anchor Bolts and Anchor Rods

Carbon steel	ASTM F1554, Grade 36 with compatible nuts.
Galvanized steel	ASTM F1554, Grade 36 with compatible nuts; hot-dip galvanized, ASTM F2329.
Stainless steel	Bolts, ASTM F593, Alloy Group 2; nuts, ASTM F594, Alloy Group 2.
Flat Washers	ANSI B18.22.1; of the same material as anchor bolts and nuts.

Expansion Anchors in Concrete	Products shall be single component anchors tested in accordance with ICC AC193, and shall have an ICC ES report in compliance with the applicable building code. The anchors shall be approved for use in cracked concrete, and for resisting seismic forces. Hilti "Kwik-Bolt TZ", Powers Fasteners "Power-Stud+SD2", Simpson "Strong-Bolt 2".
Expansion Anchors in Grouted Masonry	Products shall be single component anchors tested in accordance with ICC AC01, and shall have an ICC ES report in compliance with the applicable building code. Hilti "Kwik-Bolt 3", Simpson "Wedge-All", Powers Fasteners "Power-Stud+ SD1".
Undercut Anchors in Concrete	Products shall be tested in accordance with ICC AC193, and shall have an ICC ES report in compliance with the applicable building code. Hilti "HDA Undercut Anchor", Powers Fasteners "Atomic+ Undercut Anchor", Simpson "Torq-Cut Anchor".
Adhesive Anchors in Concrete	Products shall be tested in accordance with ICC AC308, and shall have an ICC ES report in compliance with the applicable building code. The anchors shall be approved for use in cracked concrete, and for resisting seismic forces.
Threaded Rods and Nuts	As recommended by the adhesive manufacturer; materials as indicated on the Drawings or in this specification.
Reinforcing Bars	ASTM A615, Grade 60, deformed.
Reinforcing Bars, weldable	ASTM A706, Grade 60, deformed.
Adhesive	Hilti "HIT-HY 200", Powers Fasteners "PE1000+", Simpson "SET-XP".

Adhesive Anchors in Grouted Masonry	Products shall have published design criteria values and manufacturer's printed installation instructions.
Threaded Rods and Nuts	As recommended by the adhesive manufacturer; materials as indicated on the Drawings or in this specification.
Adhesive	Hilti "HIT HY 70", Simpson "SET Epoxy".
Adhesive Anchors in Hollow Masonry	Products shall have published design criteria values and manufacturer's printed installation instructions.
Threaded Rods and Nuts	As recommended by the adhesive manufacturer; materials as indicated on the Drawings or in this specification.
Adhesive	Hilti "HIT HY 70", Simpson "SET Epoxy".
Screen Tubes	As recommended by the manufacturer.
Adhesive Anchors in Unreinforced Brick Masonry	Products shall be tested in accordance with ICC AC60, and shall have an ICC ES report in compliance with the applicable building code.
Threaded Rods and Nuts	As recommended by the adhesive manufacturer; materials as indicated on the Drawings or in this specification.
Adhesive	Hilti "HIT HY 70", Simpson "SET Epoxy".
Screen Tubes	As recommended by the manufacturer.

2-2. ANCHORS.

2-2.01. Cast-in-Place Anchor Bolts and Anchor Rods. Cast-in-place anchor bolts and anchor rods shall be delivered in time to permit setting prior to the placing of structural concrete or masonry grout. Anchor sleeves shall not be used unless acceptable to Engineer. Unless installed in sleeves, anchor bolts and anchor rods 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 and anchor rods indicated on the Drawings to have

locknuts; two nuts and a washer shall be furnished for cast-in-place anchor bolts and anchor rods without locknuts.

2-2.02. Adhesive, Expansion, and Undercut Anchors. When adhesive, expansion, or undercut 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 nuts and washers shall be furnished for adhesive anchors, expansion anchors, and undercut anchors. Adhesive anchors shall be free of coatings that would weaken the bond with the adhesive.

Adhesive anchors in hollow CMU masonry and unreinforced brick masonry shall utilize screen tubes as recommended by the manufacturer.

PART 3 - EXECUTION

3-1. GENERAL. Anti-seize thread lubricant shall be liberally applied to projecting, threaded portions of stainless steel anchors immediately before tightening of the nuts.

3-1.01. Compliance With Manufacturer's Instructions. Post-installed anchors shall be installed in accordance with the manufacturer's printed installation instructions and all applicable requirements of the ICC-ES report for the specific anchor system. If conflicts are found between the Drawings, the manufacturer's printed installation instructions, and the ICC-ES report installation requirements, Contractor shall notify Engineer for resolution.

3-1.02. Special Inspection. Special inspection requirements for cast-in-place and post-installed anchors shall be as indicated in the drawings. Anchorage work shall be performed in a manner that allows the inspections to take place without adversely impacting the schedule.

3-2. CAST-IN-PLACE ANCHOR BOLTS AND ANCHOR RODS. Cast-in-place anchor bolts and anchor rods shall be carefully positioned with templates and secured in the forms prior to placing concrete, or in the bond beams prior to placing masonry grout. Contractor shall verify that anchorage devices are positioned in accordance with the Drawings and with applicable equipment or structure submittal drawings.

Threads, bolts, and nuts spattered with concrete or masonry grout during placement shall be cleaned prior to final installation of the bolts and nuts.

Sleeves shall be filled with non-shrink grout.

3-3. ADHESIVE ANCHORS. Adhesive 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.

Anchors or bars shall be installed in holes hammer drilled into hardened concrete or masonry. Drill shall be set to rotation-only mode when drilling into hollow CMU or into brick. Diameter of holes shall be 1/16 inch larger than the outside diameter of the rod or bar unless recommended otherwise by the anchor system manufacturer. Holes shall be prepared by removing all dust and debris using procedures recommended by the adhesive manufacturer.

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 or bars shall be set in accordance with the recommendations of the manufacturer. Care shall be taken to ensure that all spaces and cavities are filled with adhesive, without voids.

3-3.01. Concrete Installation. Unless indicated otherwise on the Drawings, reinforcing bars shall be embedded to a depth that will develop the full tensile strength of the bar, and threaded rods shall be embedded to a depth that will develop the yield strength of the rod.

Adhesive anchors in concrete shall be installed under the following conditions.

Minimum Age of Concrete Prior to Anchor Installation	21 days.
Concrete Temperature Range	Maximum short-term temperature 162 F, maximum long-term temperature 110 F
Moisture Condition	Dry concrete.
Type of Lightweight Concrete	N/A
Hole Drilling and Preparation	Hammer drill only.

Installation of adhesive anchors into concrete that are either horizontal or upwardly inclined shall be performed only by personnel certified by the ACI/CRSI Adhesive Anchor Installation Certification Program.

3-3.02. Masonry Installation. Anchors shall be installed to meet all criteria in the manufacturer's installation instructions and ICC-ES reports, including but not limited to minimum edge distances, minimum clearances from mortar joints, minimum anchor spacing, and use of screen tubes.

3-4. EXPANSION AND UNDERCUT ANCHORS. Expansion and undercut anchors shall be installed using all procedures and accessory devices recommended by the anchor manufacturer.

End of Section

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Section 06730

FIBERGLASS-REINFORCED PLASTIC (FRP)

PART 1 – GENERAL

1-1. SUMMARY

1-1.01. This section includes, but is not limited to, new fiberglass reinforced plastic FRP; grating for elevated platforms and walkways, and new FRP ladders.

1-2. REFERENCES

1-2.01. General:

1-2.01.01 The following documents form part of the Specifications to the extent stated. Where differences exist between codes and standards, the most stringent shall apply.

1-2.01.02. Unless otherwise noted, the referenced standard edition is the current one at the time of commencement of the Work.

1-2.02. Manual of Steel Construction of the AISC, 13th edition.

1-2.03. ASTM International applicable standards.

1-3. SUBMITTALS

1-3.01. Submit shop detail drawings.

1-3.02. Submit manufacturer's specifications and installation instructions.

1-3.03. Prior to fabrication, provide complete shop, erection, installation, and assembly drawings for the Work, including anchor bolt setting plan, as required to assemble all parts, components and accessories. Drawings shall indicate the piece marks of all parts to be erected or assembled and clearly depict the methods and sequence of assembly and erection.

1-3.04. Copies of shop drawings, including erection drawings, shall be submitted within the accordance of the Greenbook and Whitebook Submittals sections for review before the start of fabrication. The review is of a general nature only, and all responsibility for compliance with Drawings, specifications and dimensions shall remain with the Contractor. The Contractor shall verify all layout dimensions with the Drawings, and will notify the Engineer of any discrepancy and/or omis-

sion. Do not fabricate any members until all dimensions have been verified and resolved.

1-4. QUALITY ASSURANCE

1-4.01. Manufacturer's Qualifications:

1-4.01.01. The manufacturer shall be experienced in the manufacture of Fiber-glas® reinforced plastic structures of equivalent type, size, and complexity. FRP Ladders shall be designed and fabricated by companies normally engaged in the manufacturer of such systems.

1-4.02. Design Loads:

1-4.02.01. Live Load: For gratings, 125 pounds per square foot (minimum), 2000 pounds concentrated load with 1/4 inch or less deflection.

1-5. DELIVERY, STORAGE, AND HANDLING

1-5.01. Deliver to the site all materials required for erection. Place members and components off the ground using pallets, platforms, or other supports. Provide covers, and protect members and packaged materials from the weather.

PART 2 – PRODUCTS

2-1 . MATERIALS

2-1.01. Primary Framing:

2-1.01.01. Structural shapes shall be pultruded from Vinylester Resin Series 1625 by Creative Pultrusions, Isophthalic Polyester Series 525 by Extren, or equal, having as class I fire rating per ASTM E 84 with the following minimum strength characteristics:

PROPERTY	TEST METHOD	VALUE
Flexural Strength	ASTM-D-790	Longitudinal 37,000 PSI Transverse 10,000 PSI
Flexural Modulus	ASTM-D-790	Longitudinal 2.0 x 10 ⁶ PSI Transverse 1.0 x 10 ⁶ PSI
Compressive Strength	ASTM-D-695	Longitudinal 37,500 PSI Transverse 20,000 PSI

Tensile Strength	ASTM-0-638	37,500 PSI
Shear Strength	ASTM-D-732	7,000 PSI
Modulus of Elasticity		2.8x10 ⁶ PSI

2-1.01.02. Fasteners and saddle clips: 316 stainless steel (S.S.)

2-2. FABRICATION

2-2.01. Structural members, fasteners, and accessories shall be shop fabricated in accordance with applicable ASTM standards.

2-2.02. Materials furnished shall be within the standard industry tolerances for that material as specified by the manufacturer.

2-2.03. Manufacturer's workmanship shall be such that the parts are accurately made and true to dimension so that in erection of same, all parts will properly fit together.

2-2.04. The dimensional tolerances of pultruded shapes shall be as specified in ASTM 3917 "Standard Specifications for Dimensional Tolerances of Thermosetting Glass Reinforced Plastic Pultruded Shapes".

2-2.05. All FRP grating and structural members that are cut or drilled shall have those affected surfaces sealed with catalyzed resin sealant prior to installation. The resin and other materials used shall be compatible with the environment and as a minimum shall be similar to, if not the same, as the base resin used.

2-2.06. Fabrication and installation of all pultruded shapes shall be done in such a way as to prevent attack from corrosive agents. Extra care should be taken to prevent any damage to the pultruded sections. Scratches and gouges, as well as all cut edges and drilled holes, shall be resin sealed to prevent excessive attack of the laminate. The resin and other materials used shall be compatible with the environment and as a minimum shall be similar to, if not the same, as the base resin used. Drilled holes may be oversized a maximum of 1/16 inch.

2-3. FIBERGLASS LADDERS

2-3.01. Fiberglass ladders shall be designed to meet the requirements of OSHA Section 1910.27 and ANSI-A14.3. Ladders with climbing heights greater than 20 feet or where the length of climb is less than 20 feet but the top of the ladder is more than 20 feet above the ground, floor, or roof level, shall be provided with cages or fall prevention devices as indicated on the Drawings. Rest platforms shall be provided to limit straight climbs to maximum 30 feet.

2-3.02. Fiberglass ladders shall be mounted to structures as indicated on the Drawings. If mounting details are not indicated, bracket connectors shall be stainless steel bolts when attached to structural steel or stainless steel adhesive anchors when attached to concrete or masonry.

2-3.03. Fiberglass ladder shall be Fibergrate Composite Structures "Dynarail", Strongwell "Safrail", or approved equal. FRP ladders shall be made of vinylester resin. Polyester resin products will not be allowed as an "or equal".

2-3.04. Fiberglass ladders, safety cages or climbing devices, and rest platforms shall be provided as indicated on the Drawings. Ladder rails intersecting guardrailing shall be configured to provide a safe and clear transition, although ladder rails need not be physically attached to the guardrailing. There shall be no gaps between ladder rails and adjacent guardrailing that would allow passage of a sphere greater than 4 inches in diameter. Railing gaps at ladders shall be protected by self-closing gates unless otherwise shown in the Drawings.

2-3.05. All necessary brackets, bolts, and anchors shall be provided for installing the ladders. Cut or drilled fiberglass pieces shall be sealed with catalyzed resin in accordance with the fiberglass ladders manufacturer's recommendations.

PART 3 – EXECUTION

3-1. ERECTION

3-1.01. The Subcontractor shall examine the areas and conditions under which the work is to be installed. Do not proceed with the work until unsatisfactory conditions have been corrected. Beginning of installation means the erector accepts existing conditions.

3-1.02. Erect framing, grating and accessory items in accordance with manufacturer's erection drawings and as directed by manufacturer's written recommendations.

3-1.03. All framing work shall be true to line, level, and plumb.

3-1.04. In order to prevent secondary stresses, do not force members into position. Plan erection sequences accordingly.

3-1.05. Provide temporary bracing and supports as required to ensure frame stability during erection.

3-1.06. Completed frame and grating shall comply with approved erection tolerances and shop drawing requirements.

3-1.07. Grating is to be fastened to support members with 1/4 inch diameter fasteners in the following pattern: two fasteners located between the third and fourth vertical on each end of a panel and one fastener in the middle on intermediate supports.

3-2. CLEANING

3-2.01. Upon completion of work contained in these specifications, leave all work and premises clean and in satisfactory condition.

3-3. INSPECTION

3-3.01. The completed assembly shall undergo a final inspection by manufacturer's representative to certify that the finished product has been erected in accordance with the manufacturer's shop drawings and these Specifications.

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Section 09880

CORROSION PROTECTION LINING SYSTEMS

PART 1 - GENERAL

1-1. SCOPE. This section covers furnishing and installation of corrosion protection systems to be applied to floors and walls at the chemical storage facilities, as well for spot repairs within the chemical containment basins in Areas 60, 76 and 80 pump rooms as specified herein and as indicated on the Drawings. This section covers concrete surface preparation, furnishing and application of a corrosion protection system suitable for each set of specified service conditions, the engineering field services to be provided by the material manufacturer, and any appurtenances that are required to provide a completed corrosion protection system.

The Contractor shall install corrosion protection lining systems for all containment floors and walls in Area 60 chemical storage tank farm and Area 80 ferrous chloride day tank room, including removal of the existing coating, surface preparation, concrete crack repair, grouting and caulking and lining system installation. New lining system in Area 60 shall be applied to the top of the containment walls, while in Area 80 it shall be applied to 30-inch above the finish grating elevation.

The Contractor shall install corrosion protection lining systems for all containment basins in the pump rooms within Areas 60, 76 and 80 where project improvements occur and the existing basin coating has been damaged due to the improvements and where spot repairs are required.

1-2. QUALITY ASSURANCE.

1-2.01. Manufacturer's Field Services. The applicator of the protection system shall contact the corrosion protection system material manufacturer during the bidding phase of the project and shall include in the cost of this work and the estimated cost of the manufacturers engineering field services as specified.

The field services provided by the material manufacturer shall include review of the project before surface preparation; approving the applicator, the materials, and the procedure to be used; observation and approval of the surface preparation; and observing the application. Where specified herein, the manufacturer shall also provide the adhesion testing to determine compliance with the specified minimum pull-off adhesion strength. The field representative of the protection system material manufacturer shall submit, through Contractor, written approvals of the proposed protection system materials, application

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procedures, applicator, and surface preparation. The field representative shall be an employee of the material manufacturer.

Contractor shall notify the material manufacturer and Engineer at least 10 days prior to anticipated date of placement of the protection system.

1-2.02. Applicator. The protection system applicator shall submit a satisfactory experience record including references for previous application of the specified protection system to concrete structures of similar design and complexity. The material manufacturer shall approve the applicator in writing.

1-3. SUBMITTALS. Complete specifications and data on the protection system, application instructions and procedures, and material manufacturer's approvals of the protection system furnished under this section shall be submitted in accordance with the Greenbook and Whitebook Submittals section. The lining manufacturer shall submit acceptable lining termination details for review. The protection system manufacturer shall provide certification for each component of the protection system that will provide corrosion resistance for the specified service conditions. The material manufacturer after application of the protection system shall certify that the protection system is free of pinholes and holidays.

1-4. DELIVERY, STORAGE, AND HANDLING. The material shall be delivered to the jobsite in original unopened containers with labels intact. Protection system components shall be stored indoors in an appropriate location and environment in accordance with the manufacturer's recommendations and shall be protected against freezing.

Shipping shall be in accordance with the Product Delivery Requirements section. Handling and storage shall be in accordance with the Product Storage and Handling Requirements section.

1-5. WARRANTY. Material manufacturer shall warrant the chemical resistance of each corrosion protection system for a period of three years from the date of Substantial Completion when exposed to the customer's normal operating conditions as stated in the specification. This warranty shall not cover wear and tear such as abrasion resistance or mechanical abuse.

Applicator shall warrant the lining installation for three years.

PART 2 - PRODUCTS

2-1. PERFORMANCE AND DESIGN REQUIREMENTS.

2-1.01. General Service Conditions. The linings shall provide splash and spill protection for 72 hours from the chemicals as specified herein.

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Surfaces to be coated are concrete.

2-2. MATERIALS. Materials shall be suitable for the specified service conditions. Products composing the corrosion protection system shall be chemically resistant to the chemicals, concentrations, temperatures, exposure times, and other relevant service conditions. In many cases, repair materials, primers, flexible basecoats, and other ancillary products that will be protected by a corrosion resistant and/or wear resistant layer of the protection system and may not be required to meet these criteria provided the overall protection system complies with the performance criteria. Each product of the protection system that complies with the performance requirements shall be certified as such by the protection system manufacturer. When recommended by the lining manufacturer, a vapor barrier shall be included as part of the corrosion protection system at no additional cost.

Each corrosion protection system specified is manufactured by Dudick, Inc. Acceptable alternative manufacturers that may have a corrosion protection system that will satisfy the specified service conditions and may be furnished subject to review and acceptance by Engineer, are Carboline, Ceilcote/International Co., KCC Corrosion Control Co. Ltd, PolySpec Corporation, Sherwin-Williams Control Tech Corrosion Protection Systems and Tnemec Company without exception. Other manufacturers and their corrosion protection systems will not be acceptable.

2-2.01. Epoxy Protection Systems.

2-2.01.01. Service Conditions for Epoxy Protection Systems.

Chemicals to be contained at the maximum chemical temperature of 120°F that are not corrosive to concrete, do not stain concrete, and are not hazardous to the environment:

Polymer.

Epoxy protection systems will be exposed to sunlight, UV, and outdoor atmosphere.

2-2.01.02. System Requirements for Epoxy Protection Systems.

Type of lining system.	Lining , mat reinforced with flexible basecoat.
Location(s) where mat reinforce with flexible basecoat lining	Area 60 Chemical Storage Tank Farm Containment Basins for: Polymer Bulk

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system is required:

Storage (T-1, T-2, T-11, T-12, T113, and T-14 basins), Polymer Mixing (T-21,22,23,24 basin)(7 total basins); Area 60 Polymer Recycle/Transfer Pump Area Containment Basins; Area 60 Polymer Mixing Pump Containment Basins

2-2.01.03. Epoxy Coating Protection System. Not used.

2-2.01.04. Epoxy Flexible Lining Protection System. When an epoxy lining system with a flexible basecoat is required, the corrosion protection system shall be a two-component, 100 percent solids, solvent-free, epoxy resin, silica filled, fiberglass mat reinforced flexible basecoat, high-build protective and waterproofing lining, Dudick "Protecto-Flex 310". All resins in this system shall be 100 percent solids with at least two components. The concrete surface primer shall be a conductive, amine cured epoxy resin, Dudick "Primer 67C". The flexible basecoat shall be certified by the material manufacturer as capable of not less than 50 mils of differential movement without damaging the corrosion protection system. The basecoat shall be a flexible epoxy resin with silica fillers with a chopped strand mat reinforcement and saturant. The finish coats shall be amine cured epoxy resin.

2-2.02. Vinyl Ester Protection Systems. Not used.

2-2.03. Vinyl Ester With Graphite Filler Protection Systems.

2-2.03.01. Service Conditions for Vinyl Ester With Graphite Filler Protection Systems.

Chemicals to be contained at the maximum chemical temperature of 120°F , unless otherwise indicated, that are corrosive to concrete:

Ferric chloride; 45% conc.

Ferrous chloride; up to 35% conc.

Sodium hydroxide; 150°F .

Sodium hypochlorite; up to 15% conc.

Vinyl ester with graphite filler protection systems will be exposed to sunlight, UV, and outdoor atmosphere.

2-2.03.02. System requirements for Vinyl Ester With Graphite Filler Protection Systems.

Type of lining system.	Lining, mat reinforced with flexible basecoat.
Location(s) where a mat reinforced with flexible basecoat lining corrosion protection system is required:	Area 60 Chemical Storage Tank Farm Containment Basins for: Ferric Chloride (T-71 and T-72 basins), Ferrous Chloride (T-81/T-82 basin), Sodium Hydroxide (T-41/T-42 basin), Sodium Hypochlorite (T-51/T-52 basin); Area 60 Pump Room Containment Basins for chemicals noted above. Area 80 Ferrous Chloride day tank feed room.

2-2.03.03. Vinyl Ester With Graphite Filler Coating System. Not used.

2-2.03.04. Vinyl Ester With Graphite Filler Rigid Lining System. Not used.

2-2.03.05. Vinyl Ester With Graphite Filler Flexible Lining System. The corrosion protection system shall be a two component, 100 percent solids, solvent-free, vinyl ester resin, graphite filled, mat reinforced flexible basecoat, high-build protective and waterproofing lining, Dudick "Protecto-Flex 805". Concrete surface primer shall be a epoxy resin containing conductive fillers, 100 percent solids, Dudick "Primer 67C". The flexible basecoat shall be certified by the material manufacturer as capable of not less than 50 mils of differential movement without damaging the corrosion protection system. Flexible basecoat with reinforcement shall be epoxy resin with silica fillers. Reinforcement shall be chopped strand mat. Saturant for reinforcement shall be epoxy resin. Finish coats shall be a two component, 100 percent solids, solvent-free, graphite filled vinyl ester resin.

2-2.04. Novolac Vinyl Ester Protection Systems. Not used.

2-2.05. Novolac Epoxy Protection Systems.

2-2.05.01. Service Conditions for Novolac Epoxy Protection Systems.

Chemicals to be contained at the maximum chemical temperature as indicate that are corrosive to concrete:

Sulfuric acid; up to 98% conc. at 150° F .

Novolac epoxy protection systems will be exposed to sunlight, UV, and outdoor atmosphere.

2-2.05.02. System requirements for Novolac Epoxy Protection Systems.

Type of lining system.	Lining, mat reinforced with flexible basecoat.
Location(s) where a mat reinforced with flexible basecoat lining corrosion protection system is required:	Area 60 Chemical Storage Tank Farm Containment Basins for: Sulfuric Acid (T-61/T-62 basin); Area 60 Pump Room Containment Basin for sulfuric acid pumps

2-2.05.03. Novolac Epoxy Coating Protection System. Not used.

2-2.05.04. Novolac Epoxy Rigid Lining Protection System. Not used.

2-2.05.05. Novolac Epoxy Flexible Lining Protection Systems. The novolac epoxy corrosion protection system shall be a two component, 100 percent solids, solvent-free, novolac epoxy resin, silica filled, high-build protective and waterproofing coating, Dudick "Protecto-Flex 100XT". Concrete surface primer shall be a epoxy resin containing conductive fillers, 100 percent solids content, Dudick "Primer 67C". The flexible basecoat shall be certified by the material manufacturer as capable of not less than 50 mils of differential movement without damaging the corrosion protection system. Flexible basecoat with reinforcement shall be an epoxy resin with silica fillers and chopped strand fiberglass mat. Saturant for reinforcement shall be epoxy resin. Finish coats shall be a two component, 100 percent solids, novolac epoxy resin.

2-2.06. Epoxy Filler Compound. Epoxy filler compound for concrete surfaces shall be a two-component, 100 percent solids epoxy filler or as recommended by the corrosion protection system material manufacturer.

2-2.07. Corrosion Resistant Caulking/Sealant. Chemical resistant caulking/sealant shall be suitable for the specified service conditions and shall be as recommended, in writing, by the protection system material manufacturer.

2-2.08 Reinforced Epoxy Resin Topping Systems. Not used.

2-2.09 Reinforced Vinyl Ester Resin Topping Systems. Not used.

2-2.10 Reinforced Vinyl Ester with Graphite Resin Topping Systems. Not used.

2-2.11 Reinforced Novolac Vinyl Ester Resin Topping Systems. Not used.

2-2.12 Reinforced Novolac Epoxy Resin Topping Systems. Not used.

PART 3 - EXECUTION

3-1. GENERAL. All details, methods, and procedures of mixing, surface preparation, bonding, application, finishing, curing, and protection of the protection system shall be in strict accordance with the recommendations of the material manufacturer. The applicator shall comply with the recommendations of the material manufacturer's engineering field representative.

Contractor shall prepare a coating schedule for installation of all coatings and linings meeting the requirements and conditions of the Construction Sequencing section prior to any Work. Installation of coatings and linings may require phasing in order to maintain continuous operation of the chemical feed systems and storage tanks, as well to account for other Work performed in the basin and installation timing of other improvements. Coating and lining shall only commence upon approval of the coating schedule. Deviations to the schedule shall be submitted to the Engineer a minimum of 48 hours prior to the deviation for review and approval.

3-2. SURFACE PREPARATION. All surfaces shall be free of objectionable substances and shall meet the manufacturer's recommendations for surface preparation. If the lining material manufacturer recommends any other surface preparation, it shall be brought to Engineer's attention and may be incorporated into the work if acceptable to Engineer.

All surfaces shall be dry when coated or lined, and shall be free from dirt, dust, sand, mud, oil, grease, rust, mill scale, and other objectionable substances. Oil and grease shall be completely removed as recommended by the material manufacturer before mechanical cleaning is started.

3-2.01. Concrete Surfaces. Concrete surfaces shall be prepared in accordance with SSPC-SP13/NACE 6. Concrete surfaces shall be prepared until they are acceptable to the lining material manufacturer. Surfaces shall be free of cracks, pits, projections, or other imperfections that would interfere with the formation of a smooth, unbroken coating film. For the Area 60 chemical storage tank farm and Area 80 ferrous chloride room, the existing coating shall be completely removed prior to new lining installation.

If any repairs to existing concrete are required, they shall be made as part of the surface preparation in accordance with the Concrete Repair section. Cracks in

the Area 60 and Area 80 chemical storage tank farm floors and walls shall be repaired prior to installation of the new linings.

New concrete shall be cured for at least 28 days before lining is applied and shall be ready to receive the lining as determined by the material manufacturer. Existing concrete repair areas shall be cured before lining is applied. Existing concrete repair cure time shall be per the recommendations of the approved and applied concrete repair sealer manufacturer. Concrete surfaces shall be tested for capillary moisture in the concrete in accordance with ASTM D4263. There shall be no capillary moisture migration after 24 hours as determined by the test method. If the manufacturer recommends using the calcium chloride test method to test for capillary moisture migration in the concrete and the test results exceed 3 pounds per 24 hours per 1,000 square feet or more stringent conditions recommended by the lining manufacturer, the corrosion protection system shall include a vapor barrier that is recommended by the protection system manufacturer.

Adhesion testing shall be conducted as specified herein after the concrete surface has been prepared and approved by the lining material manufacturer. Adhesion strength test results shall exceed 400 psi or a higher value if recommended by material manufacturer.

All concrete surfaces to be lined shall be cleaned in accordance with ASTM D4258 and abrasive blasted in accordance with ASTM D4259. Before the lining is applied, the surfaces shall be thoroughly washed or cleaned by air blasting to remove all dust and residue. The Contractor shall repair all concrete surfaces that have spalls, voids, and cracks and shall remove all fins and other surface projections to produce a flush surface for application of the protection system.

Surface profile shall be at least 4 mils for a coating protection system and at least 22 mils for a lining protection system, but shall not be less than 25 percent of the dry film thickness specified for the corrosion protection system or 40-60 grit sandpaper unless recommended otherwise by the material manufacturer.

Concrete surfaces, including those with bug holes less than 1 inch in any dimension, shall be prepared using an epoxy concrete filler or as recommended by the material manufacturer and acceptable to Engineer.

3-2.02. Metal Surfaces. All sharp edges, corners, and welds shall be ground, removing all weld slag and splatter. Welds and sharp edges shall be ground smooth. The surfaces shall be abrasive blasted in conformance with SSPC SP5 to at least a 3 mils surface profile.

3-2.03. Existing Coated Surfaces. Surfaces to be coated with an existing coating (i.e. spot repair locations in area 60, 76 and 80) shall be prepared per the

recommendations of the new coating manufacturer. Coating compatibility patch tests shall be performed per ASTM D5064 prior to applying the coating to the existing coating. Allow the test patch to cure for a minimum of 12 days before examination, regardless of the temperature. Adhesion test should be in accordance with ASTM D6677.

3-3. MIXING AND THINNING. Materials shall be thoroughly mixed each time any is withdrawn from the container, and the containers shall be kept tightly closed except while the material is being withdrawn.

Protection system components shall be mixed to proper consistency and viscosity in accordance with the manufacturer's recommendations. Thinning will not be permitted. No adulterant, unauthorized thinner, or other material not included in the formulation, shall be added to the protection system components for any purpose

3-4. APPLICATION. Corrosion protection system shall be applied in accordance with the manufacturer's recommendations and in a neat manner, with finished surfaces free of runs, sags, ridges, laps, and brush marks. In no case shall the wet film thickness of applied protection system be less than the thickness recommended by the material manufacturer.

Grit shall be broadcast into first finish lining coat to produce an anti-skid surface.

Each coat shall be applied over the previous coat in accordance with the recommendations of the material manufacturer. Each coat shall be applied in a manner that will produce an even film of uniform and proper thickness. In no case shall coating be applied at a rate of coverage which is greater than the maximum rate recommended by the material manufacturer.

Recoating shall be applied in accordance with manufacturer's recommendations.

Alternate coats shall be of contrasting colors to facilitate in obtaining complete coverage. The first coat shall be a dark color.

Protection system showing checks, blisters, excessive sags, teardrops, or fat edges will not be acceptable and shall be entirely removed and the surface recoated. The protection system shall be free of pinholes and holidays.

Protection system shall be applied when surface temperature is at least 50°F and at least 5°F above dew point, and relative humidity is 85 percent or lower. Protection system shall not be applied in direct sunlight or when the temperature of the concrete is rising. Preferably the protection system shall be applied when the temperature of the concrete is dropping.

When applying high build protection system with a roller or brush and where a dry film thickness of at least 4 mils per coat is required, two or more coats shall be applied to achieve the recommended dry film thickness equal to a spray applied coating.

For applications over existing construction joints in concrete, Contractor shall perform the following, including meeting the coating manufacturer's recommendations:

- a. Remove the top portion of the existing construction joint filler material, up to a maximum depth of 1.5 inches.
- b. Install corrosion resistant sealant/caulking (Dudick Caulk 149 or equal) within construction joint to create a surface flush with the existing concrete. Sealant/caulking shall be applicable with the specified corrosion protection lining system.
- c. Prime surface above the construction joint with corrosion resistant primer (Dudick Prime 67 or equal) applicable with the specified corrosion protection lining system.
- d. Install corrosion resistant protection lining system, as specified in Part 2.2, to the edges of the construction joint.
- e. Install 12 to 15 mils DFT of a fluoroelastomer coating (Dudick Caulk 100XT or equal) over and 2-inches beyond the construction joint covering the primer and corrosion resistant protection lining system specified.

3-4.01. Epoxy Protection Systems.

3-4.01.01. Epoxy Coating Protection System. Not used.

3-4.01.02. Epoxy Flexible Lining Protection System. The corrosion protection system shall be applied in four or more coats. The system shall consist of one prime coat, one basecoat with reinforcement and saturant, and two or more finish coats. The prime coat shall be at least 6 mils wet film thickness (WFT). The basecoat shall be trowel applied, to a thickness that provides the specified minimum differential movement. The reinforcement shall be pressed firmly into the basecoat, and then saturated with the basecoat resin mixture. Each finish coat shall be 8 mils dry film thickness (DFT). The protection system shall have a total thickness of at least 90 mils DFT.

3-4.02. Vinyl Ester Protection Systems. Not used.

3-4.03. Vinyl Ester With Graphite Filler Protection Systems.

3-4.03.01. Vinyl Ester With Graphite Filler Coating System. Not used.

3-4.03.02. Vinyl Ester With Graphite Filler Rigid Lining System. Not used.

3-4.03.03. Vinyl Ester With Graphite Filler Flexible Lining System. The corrosion protection system shall be applied in four or more coats. The protection system shall consist of one prime coat, one basecoat, reinforcement and saturant, and two or more finish coats. The prime coat wet film thickness shall be at least 5 mils. The flexible basecoat shall be trowel applied, to a thickness that provides the specified minimum differential movement. The reinforcement shall be pressed firmly into the basecoat, and then saturated with the basecoat resin mixture. Each finish coat shall be 15-20 mils dry film thickness. The protection system shall have a total dry film thickness of at least 100 mils .

3-4.04. Novolac Vinyl Ester Protection Systems. Not used.

3-4.05. Novolac Epoxy Protection Systems.

3-4.05.01. Novolac Epoxy Coating Protection System. Not used.

3-4.05.02. Novolac Epoxy Rigid Lining Protection System. Not used.

3-4.05.03. Novolac Epoxy Flexible Lining Protection Systems. The corrosion protection system shall be applied in four or more coats. The protection system shall consist of one prime coat, one basecoat, reinforcement and saturant, and two or more finish coats. The prime coat wet film thickness shall be at least 4 mils . The basecoat shall be trowel applied, to a thickness that provides the specified minimum differential movement. The reinforcement shall be pressed firmly into the basecoat, and then saturated with the basecoat resin mixture. Each finish coat shall be 15-20 mils dry film thickness. The protection system shall have a total dry film thickness of at least 100 mils .

3-4.06. Corrosion Resistant Caulking/Sealant. Corrosion resistant caulking/sealant shall be used at any penetration in the lining, such as at anchorage of pipe supports and chemical storage tanks.

3-4.07 Topping System. Not used.

3-5. FIELD QUALITY CONTROL. The surfaces shall be cleaned and prepared as needed to properly conduct the visual inspection, spark testing, and adhesion testing. All inspection and testing shall be witnessed by Engineer. Repairs shall be acceptable to Engineer.

3-5.01. Visual Inspection. The surface of the liner shall be visually inspected for areas showing poor adhesion, air inclusion, or other imperfections in the lining that prevent a complete seal of the surfaces.

3-5.02. Spark Testing. All detected holidays and pinholes shall be marked and repaired as recommended by the material manufacturer.

3-5.02.01. Concrete Surfaces. After the linings are applied, the material manufacturer shall spark-test all lined concrete surfaces using a high-voltage electrical spark tester in accordance with ASTM D4787 and set at the recommended voltage, or as a minimum at 100 volts per mil of liner thickness. Before beginning the spark testing the material manufacturer shall verify the testing equipment is working properly. The electrode movement shall be continuous and shall proceed in a systematic manner that will cover 100 percent of the lining surface. A carbon fiber brush shall be used on the sensor electrode.

3-5.02.02. Metal Surfaces. After liners are installed, the material manufacturer shall spark-test all lined metal surfaces using an acceptable high-voltage electrical spark tester set at the recommended voltage. The material manufacturer shall verify the testing equipment is working properly before beginning the spark testing of the lining. The electrode movement shall be continuous and shall proceed in a systematic manner that will cover 100 percent of the lining surface.

3-5.03. Adhesion Testing. An adhesion test shall be conducted on allepoxy, vinyl ester with graphite fill, and novolac epoxy protection systems specified herein. Adhesion testing shall be conducted before application of the lining, on a properly prepared concrete surface that is acceptable to the material manufacturer and Engineer. The test area shall be at least 2 square feet to allow a minimum of three tests to be conducted. The test area shall be coated with the specified system and cured as recommended by the material manufacturer. Pull-off strength adhesion tests shall be conducted by the material manufacturer in accordance with ASTM D7234 for concrete surfaces using an Elcometer tensile adhesion tester. At least three adhesion tests shall be conducted and the results averaged. Adhesion strength shall equal or exceed the minimum adhesion strength recommended by the material manufacturer and shall exceed the tensile strength of the concrete.

If the lining fails the adhesion test, the cause of the failure shall be determined and corrected before the test is repeated.

3-6. PROTECTION. Care shall be taken to prevent coating from being dropped or spilled on adjacent surfaces, buildings, structures, or facilities. All surfaces so damaged shall be cleaned, repaired, replaced, or painted as acceptable to Engineer.

End of Section

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Section 09940

PROTECTIVE COATINGS

PART 1 - GENERAL

1-1. SCOPE. This section covers field applied protective coatings, including surface preparation, protection of surfaces, inspection, and other appurtenant work for equipment and surfaces designated to be coated with heavy-duty maintenance coatings. Regardless of the number of coats previously applied, at least two field coats in addition to any shop coats or field prime coats shall be applied to all surfaces unless otherwise specified. This section shall be utilized for coating new chemical system piping, and other project improvements requiring coatings in Area 60, 76 and 80, excluding the Area 60 and area 80 containment basin floors and walls specified in Corrosion Protection Lining Systems.

1-2. GENERAL. Cleaning, surface preparation, coating application, and thickness shall be as specified herein and shall meet or exceed the coating manufacturer's recommendations. When the manufacturer's minimum recommendations exceed the specified requirements, Contractor shall comply with the manufacturer's minimum recommendations. When equivalent products are acceptable to Engineer, Contractor shall comply with this Specification and the coating manufacturer's recommendations.

1-2.01. Governing Standards. All cleaning, surface preparation, coating application, thickness, testing, and coating materials (where available) shall be in accordance with the referenced standards of the following AWWA, ANSI, NACE, SSPC, NSF, and ASTM.

1-2.02. Delivery and Storage. All coating products shall be received and stored in accordance with the coating manufacturer's recommendations.

1-2.03. Coatings, Painting, and Linings Covered in Other Sections.

Architectural painting.

Corrosion protection lining systems for secondary containment.

1-3. SUBMITTALS. Contractor shall submit color cards for all coatings proposed for use, together with complete descriptive specifications, manufacturer's product data sheet and the completed Coating System Data Sheets, to Engineer for review and color selection. Each product data sheet shall include application temperature limits including recoat time requirements for the ambient conditions

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at the site, including temperatures up to 130°F . Requests for review submitted directly to Engineer by coating suppliers will not be considered.

When the proposed products will be in contact with treated or raw water in potable water treatment facilities, Contractor shall submit certifications that the proposed systems are in compliance with ANSI/NSF 61.

Contractor shall submit a Coating System Data Sheet for each separately identified surface in the Metal Surfaces Coating Schedule, Concrete and Masonry Surfaces Coating Schedule, and the Miscellaneous Surfaces Coating Schedule that will be used in the Project, using the appropriate Coating System Data Sheet forms (Figures 1-09940 and 2-09940) at the end of this section. Each field coating system shall be acceptable to the coating material manufacturer.

Coating System Data Sheets shall be assigned a unique number with a prefix letter based on the following:

Prefix	Surfaces	Fig.09940
A	Iron and steel (coated entirely in field)	1
A	Iron and steel (shop primed)	2
C	Concrete and concrete block	1
E	Equipment - submerged	1
E	Equipment – nonsubmerged	2
F	Nonferrous metal	1
G	Galvanized	1
H	High temperature	1
P	PVC and FRP	1

Each coating system that will be applied entirely in the field shall be assigned only a prefix letter and no suffix letter. Fig.1-09940 shall be submitted for each surface coated entirely in the field.

Each shop-applied coating system that includes one or more field applied coats shall be assigned both a prefix letter and suffix letter "F". Fig.2-09940 shall be submitted for each surface having a shop applied coating and one or more field applied finish coats.

A separate Coating System Data Sheet shall be developed and submitted for each surface scheduled to be coated or variation or change in a coating system.

The number identifying the surface and coating system shall be of the form A1₁ or A1₂-F. The subscript number shall be assigned by the Contractor so that each surface and coating system combination is uniquely identified. For example:

A1₁-F may be assigned to "Epoxy – one coat to metal curbs for skylights and power roof ventilators that have been shop primed."

A2₁ may be assigned to "Epoxy – two coats to non-galvanized structural and miscellaneous steel exposed to view inside buildings."

C2₁ may be assigned to "Epoxy – two coats to all concrete and concrete block in corrosive area (Except floors and surfaces scheduled to receive other coatings) which are exposed to view."

C2₂ may be assigned to "Epoxy – two coats to walls, floors, and curbed areas, adjacent to corrosive chemical storage and feed equipment as indicated on the Drawings."

For the epoxy and for aliphatic polyurethane, a total of not more than 5 custom colors (excluding deeptone or high-level colors) may be required. The manufacturer's standard colors will be acceptable for all other coatings.

1-4. QUALITY ASSURANCE.

1-4.01. Coating System Data Sheet Certifications. The coating applicator and coating manufacturer shall review and approve in writing the coating manufacturer's written recommendations for the coating system and the intended service. Any variations from the Specifications or the coating manufacturers published recommendations shall be submitted in writing and approved by the coating manufacturer.

1-4.02. Special Interior Coating Systems. Not used.

PART 2 - PRODUCTS

2-1. ACCEPTABLE MANUFACTURERS.

2-1.01. Alternative Manufacturers. In addition to the coatings listed herein, equivalent products of other manufacturers that distribute globally will also be acceptable.

2-1.02. Equivalent Coatings. Whenever a coating is specified by the name of a proprietary product or of a particular manufacturer or vendor, it shall be understood as establishing the desired type and quality of coating. Other manufacturers' coatings will be accepted, provided that sufficient information is submitted to enable Engineer to determine that the proposed coatings are

equivalent to those named. Information on proposed coatings shall be submitted for review in accordance with the Greenbook and Whitebook Submittals section. Requests for review of equivalency will be accepted only from Contractor, and will be considered only after the contract has been awarded.

2-2. MATERIALS. All coatings shall be delivered to the job in original, unopened containers, with labels intact. Coatings shall be stored indoors and shall be protected against freezing. No adulterant, unauthorized thinner, or other material not included in the coating formulation shall be added to the coating for any purpose.

All coatings shall conform to the air quality regulations applicable at the location of use. Coating materials that cannot be guaranteed by the manufacturer to conform, whether or not specified by product designation, shall not be used.

With the exception of heat resistant coatings, the coatings specified have been selected on the basis of the manufacturer's statement that the VOC content of the product is 2.8 lbs per gallon or less; however, it shall be the Contractor's responsibility to use only coating materials that are in compliance with the requirements of all regulatory agencies. Local regulations may require some coatings to have a lower VOC content than specified herein. The coatings specified may meet the VOC limits in the unthinned (as shipped) condition, but may exceed the limits if thinned according to the manufacturer's recommendations. In such case, the coatings shall not be thinned beyond the 2.8 lbs per gallon limit, and if the product cannot be thinned to suit the application method or temperature limits, another manufacturer's coating shall be used, subject to acceptance by Engineer.

Contractor shall be responsible for ensuring the compatibility of field coatings with each other or with any previously applied coatings. Coatings used in successive field coats shall be produced by the same manufacturer. The first field coat over shop coated or previously coated surfaces shall cause no wrinkling, lifting, or other damage to underlying coats.

All intermediate and finish coating materials that will be in contact with wastewater atmosphere shall be guaranteed by the manufacturer to be fumeproof and suitable for wastewater plant atmosphere that contains hydrogen sulfide. Coatings that cannot be so guaranteed shall not be used. Lead-free, chromium-free, and mercury-free coatings shall be used.

2-2.01 Primers.

Universal Primer (tie coat)

PPG Amercoat "Amercoat 385 Epoxy", Carboline "Rustbond", ICI Devoe "Devran 224HS", Tnemec "Series 27 F.C. Typoxy", Dudick

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Zinc Primer	"Primer 67", or Sherwin-Williams "Dura Plate 235". PPG Amercoat "Dimetate 9 Series", Carboline "Carbo Zinc II Series", ICI Devoe "Catha-Coat 304V", or Sherwin-Williams "Zinc Clad II Series".
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2-2.02. Fillers and Surfacers.

Epoxy Concrete Block Filler	PPG Amercoat "Amerlock 400BF Epoxy Block Filler", Carboline "Sanitile 600", ICI Devoe "Truglaze 4015", Tnemec "Series 54-562", Dudick "Black Filler", or Sherwin-Williams "Kem Cati-Coat HS".
Epoxy Concrete Filler and Surfer	Tnemec "Series 218 MortarClad", PPG Amercoat "NuKlad 114A", Carboline "Carboguard 510", Dudick "Scratch Coat 300", or Sherwin-Williams "Steel Seam FT910".

2-2.03. Intermediate and Finish Coatings.

Epoxy (NSF certified systems)

Ferrous Metal Surfaces and Concrete Surfaces in Contact with Treated or Raw Water in Potable Water Facilities	PPG Amercoat "Amerlock 400 High-Solids Epoxy Coating", Carboline "Carboguard 891", ICI Devoe "Bar-Rust 233H" Tnemec "Series N140 Pota-Pox Plus", Dudick "Protecto-Coat 310NSF", or Sherwin-Williams "Dura Plate 235 NSF"; immersion service.
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Epoxy

Concrete Floors	PPG Amercoat "Amerlock 400", Carboline "Carboguard 890", ICI Devoe "Devran 224HS", Tnemec "Series N69 Hi-Build Epoxoline II", Dudick "Protecto-Coat 325", or Sherwin-Williams "Armorseal 1000HS"; nonskid.
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Ferrous Metal Surfaces and Masonry or Concrete Surfaces Other Than Floors	PPG Amercoat "Amercoat 385 Epoxy", Carboline "Carboguard 890", ICI Devoe Devran "224HS", Tnemec "Series N69 Hi-Build Epoxoline II", Ducick "Protecto-Coat 325", or Sherwin-Williams "Dura Plate 235".
Flake-Filled Epoxy	Carboline "Plasite 4500/4500S", Dudick "Protecto-Coat 300", or Sherwin-Williams "Sher-Glass FF",
Aliphatic Polyurethane	PPG Amercoat "Amercoat 450H", Carboline "Carbothane 134HG", ICI Devoe "Devthane 379H" Tnemec "Series 1074 Endura-Shield II", Dudick "Sealer 30", or Sherwin-Williams "Acrolon 218HS".
Coal Tar Epoxy	High-build coal tar epoxy; PPG Amercoat "Amercoat 78HB Coal Tar Epoxy", Carboline "Bitumastic 300 M", Tnemec "46H-413 Hi-Build Tneme-Tar", Dudick "Protecto-Coat 1000", or Sherwin-Williams "Hi-Mil Sher-Tar Epoxy".
Medium Consistency Coal Tar	Carboline "Bitumastic 50" or Tnemec "46-465 H.B. Tnemecol".
Vinyl Ester	Tnemec "Series 120 Vinester" Carboline "Plasite 4110", Dudick "Protecto-Coat 900", or Sherwin-Williams "Magnalux 304FF".

PART 3 - EXECUTION

3-1. SURFACE PREPARATION. All surfaces to be coated shall be clean and dry and shall meet the recommendations of the coating manufacturer for surface preparation. Freshly coated surfaces shall be protected from dust and other contaminants. Oil and grease shall be completely removed by use of solvents or detergents before mechanical cleaning is started. The gloss on previously coated surfaces shall be dulled if necessary for proper adhesion of topcoats.

Surfaces shall be free of cracks, pits, projections, or other imperfections that would interfere with the formation of a smooth, unbroken coating film, except for concrete block construction where a rough surface is an inherent characteristic.

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When applying touchup coating or repairing previously coated surfaces, the surfaces to be coated shall be cleaned as recommended by the coating manufacturer, and the edges of the repaired area shall be feathered by sanding or wire brushing to produce a smooth transition that will not be noticeable after the coating is applied. All coatings made brittle or otherwise damaged by heat of welding shall be completely removed.

3-1.01. Galvanized Surfaces. Galvanized surfaces shall be prepared for coating according to the instructions of the manufacturer of the epoxy. Any chemical treatment of galvanized surfaces shall be followed by thorough rinsing with clean water.

3-1.02. Ferrous Metal Surfaces. Ungalvanized ferrous metal surfaces shall be prepared for coating by using one or more of the following cleaning procedures specified here-in: solvents (SSPC-SP1); abrasive blasting (SSPC-SP5, -SP10, -SP6, or -SP7) power tools (SSPC-SP3 or -SP11); or hand tools (SSPC-SP2). Oil and grease shall be completely removed in accordance with SSPC-SP1 before beginning any other cleaning method. Surfaces of welds shall be scraped and ground as necessary to remove all slag and weld spatter. Tools which produce excessive roughness shall not be used.

All components of equipment that can be properly prepared and coated after installation shall be installed prior to surface preparation. Components that will be inaccessible after installation shall have the surfaces prepared and coated before installation. Motors, drive trains, and bearings shall be protected during surface preparation in accordance with the equipment manufacturer's recommendations.

All cut or sheared edges shall be ground smooth to a 1/8 inch minimum radius for all material 1/4 inch thickness and larger. For material thickness less than 1/4 inch all cut or sheared edges shall be ground smooth to a radius equal to 1/2 the material thickness. Grinding of rolled edges on standard shapes with a minimum radius of the 1/16 inch will not be required.

All ferrous metal surfaces shall have all welds ground smooth and free of all defects in accordance with NACE Standard SP0178, Appendix C, Designation C and sharp edges ground smooth, if not previously prepared in the shop. Instead of blending of the weld with the base metal as required by the NACE standard, it will be acceptable to furnish a welded joint that has a smooth transition of the weld to the base metal. All welds shall be ground smooth to ensure satisfactory adhesion of paint.

The cleaning methods and surface profiles specified herein are minimums, and if the requirements printed in the coating manufacturer's data sheets exceed the

limits specified, the value printed on the data sheets shall become the minimum requirement.

3-1.02.01. Ferrous Metal Surfaces – Non-immersion Service. Ferrous metal surfaces, including fabricated equipment, in non-immersion service shall be cleaned to the degree recommended by the coating manufacturer for surfaces to be coated with coal tar epoxy, epoxy, and heat-resistant coatings, except galvanized surfaces. Surface preparation of ferrous metal surfaces in non-immersion service shall consist of abrasive blast cleaning to SSPC-SP6, and the first application of coating shall be performed on the same day. If more surface area is prepared than can be coated in one day, the uncoated area shall be blast cleaned again to the satisfaction of Engineer. Surface profile shall be as recommended by coating manufacturer, but not less than 2.0 mils .

3-1.02.02. Ferrous Metal Surfaces - Immersion Service. Surface preparation of ferrous metal surfaces in immersion service shall consist of abrasive blast cleaning to at least SSPC-SP10 and the first application of coating shall be performed on the same day. If more surface area is prepared than can be coated in one day, the uncoated area shall be blast cleaned again to the satisfaction of Engineer. Surface profile shall be as recommended by coating manufacturer, but not less than 3.5 mils .

3-1.03. Concrete Surfaces. All concrete surfaces shall be free of objectionable substances and shall meet the coating manufacturer's recommendations for surface preparation. Concrete surfaces shall be prepared in accordance with SSPC-SP13/NACE 6. Any other surface preparation recommended by the coating material manufacturer shall be brought to Engineer's attention and may be incorporated into the work if acceptable to Engineer.

All concrete surfaces shall be dry when coated and free from dirt, dust, sand, mud, oil, grease, and other objectionable substances. Oil and grease shall be completely removed by use of solvents or detergents before mechanical cleaning is started.

New concrete shall have cured for at least 4 weeks before coating is applied as recommended by the material manufacturer. Concrete surfaces shall be tested for capillary moisture in accordance with ASTM D4263. There shall be no capillary moisture when coatings are applied on concrete.

All surfaces to be coated shall be cleaned in accordance with ASTM D4258 and abraded in accordance with ASTM D4259. Surface profile shall be at least 25 percent of the dry film thickness specified for the coating system. Prior to application of the coating, the surfaces shall be thoroughly washed or cleaned by air blasting to remove all dust and residue. Spalled areas, voids, and cracks shall be repaired in accordance with the Concrete section and as acceptable to

the Engineer. Fins and other surface projections shall be removed to provide a flush surface before application of coating.

Except where epoxy is applied as damp-proofing, the concrete surfaces, including those with bug holes less than 1 inch in any dimension, shall be prepared as recommended by the manufacturer, using an epoxy concrete filler and surfacer. Where coating with a vinyl ester the concrete filler and surfacer shall be as recommended by the manufacturer to be compatible with vinyl ester.

3-1.04. Concrete Block Surfaces. Voids and openings in concrete block surfaces shall be pointed. All exposed exterior surfaces and surfaces to be coated with epoxy, including the joints, shall be filled so that a continuous unbroken coating film is obtained.

3-1.05. Copper Tubing. All flux residue shall be removed from joints in copper tubing. Immediately before coating is started, tubing shall be wiped with a clean rag soaked in xylol.

3-1.06. Plastic Surfaces. All wax and oil shall be removed from plastic surfaces that are to be coated, including PVC and FRP, by wiping with a solvent compatible with the specified coating.

3-1.07. Hardware. Hardware items such as bolts, screws, washers, springs, and grease fittings need not be cleaned prior to coating if there is no evidence of dirt, corrosion, or foreign material.

3-1.08. Aluminum. When a coating system is required, remove all oil or deleterious substance with neutral detergent or emulsion cleaner or blast lightly with fine abrasive.

3-1.09. Stainless Steel. When a coating system is required, surface preparation shall conform to the coating manufacturer's recommendations.

3-2. MIXING AND THINNING. Coating shall be thoroughly mixed each time any is withdrawn from the container. Coating containers shall be kept tightly closed except while coating is being withdrawn.

Coating shall be factory mixed to the manufacturer's required consistency and viscosity for hot weather application without thinning. Thinning will be permitted only as necessary to obtain recommended coverage at lower application temperatures. In no case shall the wet film thickness of applied coating be reduced, by addition of coating thinner or otherwise, below the thickness recommended by the coating manufacturer. Thinning shall be done in compliance with all applicable air quality regulations.

3-3. APPLICATION. Coating shall be applied in a neat manner that will produce an even film of uniform and proper thickness, with finished surfaces free of runs, sags, ridges, laps, and brush marks. Each coat shall be thoroughly dry and hard before the next coat is applied. Each coat shall be a different color, if available. In no case shall coating be applied at a rate of coverage greater than the maximum rate recommended by the coating manufacturer.

Coating failures will not be accepted and shall be entirely removed down to the substrate and the surface recoated. Failures include but are not limited to sags, checking, cracking, teardrops, fat edges, fisheyes, or delamination.

3-3.01. Priming. Edges, corners, crevices, welds, and bolts shall be given a brush coat (stripe coat) of primer before application of the primer coat. The stripe coat shall be applied by a brush and worked in both directions. Special attention shall be given to filling all crevices with coating. When using zinc primers the stripe coat shall follow the initial prime coat.

Abraded and otherwise damaged portions of shop-applied coating shall be cleaned and recoated as recommended by the manufacturer of the finish coating. Welded seams and other uncoated surfaces, heads and nuts of field-installed bolts, and surfaces where coating has been damaged by heat shall be given a brush coat of the specified primer. Before the specified spot or touchup coating of metal surfaces, edges, corners, crevices, welds, and bolts in the area of the spot or touchup coating shall be given a brush coat of primer. This patch, spot, or touchup coating shall be completed, and the paint film shall be dry and hard, before additional coating is applied.

3-3.02. Epoxy. When used, epoxy shall be applied in accordance with the coating manufacturer's recommendations, including temperature limitations and protection from sunlight until top-coated.

When concrete is to be coated, coatings shall not be applied to concrete surfaces in direct sunlight or when the temperature of the concrete is rising. Preferably the coating shall be applied when the temperature of the concrete is dropping.

When applying high build epoxy coatings with a roller or brush and where a dry film thickness of at least 4-6 mils per coat is required, two or more coats shall be applied to achieve the recommended dry film thickness equal to a spray applied coating.

3-3.03. Coal Tar Epoxy. When used, the application of coal tar epoxy, including time limits for recoating, shall conform to the recommendations of the coating manufacturer.

When concrete is to be coated, coatings shall not be applied to concrete surfaces in direct sunlight or when the temperature of the concrete is rising. Preferably the coating shall be applied when the temperature of the concrete is dropping.

3-3.04. Vinyl Ester. When used, the application of vinyl ester coating system, including time limits for recoating and temperature requirements of the materials, shall conform to the recommendations of the coating manufacturer.

3-3.05. Film Thickness. The total coating film thickness including intermediate coats and finish coat, shall be not less than the following:

<u>Type of Coating</u>	<u>Minimum Dry Film Thickness</u>
Medium consistency coal tar	20 mils .
Coal tar epoxy (two coats)	20 mils .
Epoxy	
Floors (two coats)	10 mils .
Surfaces with first coat of epoxy and final coat of aliphatic polyurethane	7 mils (5 mils DFT for epoxy plus 2 mils DFT for aliphatic polyurethane).
Surfaces with first and second coat of epoxy and final coat of aliphatic polyurethane	12 mils (10 mils DFT for epoxy plus 2 mils DFT for aliphatic polyurethane).
Other surfaces (two coats)	10 mils .
Immersion service (three coats)	15 mils .
Flake-filled epoxy (two coats)	30 mils .
Vinyl ester	30 mils .
Zinc, epoxy, polyurethane	
Surfaces with first coat of zinc, intermediate coat of epoxy, and final coat of aliphatic polyurethane	10 mils , 3 mils zinc, 5 mils epoxy, plus 2 mils for aliphatic polyurethane.
Other (one coat)	5 mils .
Other (two coats)	10 mils .

3-3.06. Weather Conditions. Coatings shall not be applied, except under shelter, during wet, damp, or foggy weather, or when windblown dust, dirt, debris, or insects will collect on freshly applied coating.

Coatings shall not be applied at temperatures lower than the minimum temperature recommended by the coating manufacturer, or to metal surfaces such as tanks or pipe containing cold water, regardless of the air temperature, when metal conditions are likely to cause condensation. When necessary for proper application, a temporary enclosure shall be erected and kept heated until the coating has fully cured.

Coatings shall not be applied at temperatures higher than the maximum temperature recommended by the coating manufacturer. Where coatings are applied during periods of elevated ambient temperatures, Contractor and the coatings manufacturer shall be jointly responsible to ensure that proper application is performed including adherence to all re-coat window requirements. Precautions shall be taken to reduce the temperature of the surface application, especially for metal, at elevated temperatures above 100°F including shading application area from direct sunlight, applying coating in the evening or at night, and ventilating the area to reduce the humidity and temperature,

Vinyl ester coating materials, when required, shall be maintained during transportation, storage, mixing, and application at the temperature required by the coating manufacturer, 35°F to 90°F .

3-4. REPAIRING FACTORY FINISHED SURFACES. Factory finished surfaces damaged prior to acceptance by Engineer 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.

3-5. PROTECTION OF SURFACES. Throughout the work Contractor shall use drop cloths, masking tape, and other suitable measures to protect adjacent surfaces. Contractor shall be responsible for correcting and repairing any damage resulting from its or its subcontractors' operations. Coatings spilled or spattered on adjacent surfaces which are not being coated at the time shall be immediately removed. Exposed concrete or masonry not specified to be coated which is damaged by coatings shall be either removed and rebuilt or, where authorized by Engineer, coated with two coats of masonry coating.

3-6. FIELD QUALITY CONTROL. The following inspection and testing shall be performed: surface profile, visual inspection, and wet and dry film thickness testing. All inspection and testing shall be witnessed by Engineer.

3-6.01. Surface Profile Testing. The surface profile for ferrous metal surfaces shall be measured for compliance with the specified minimum profile. The surface profile for concrete shall comply with SSPC 13/NACE 6 Table 1 for severe service.

3-6.02. Visual Inspection. The surface of the protective coatings shall be visually inspected.

3.6.03. Film Thickness. Coating film thickness shall be verified by measuring the film thickness of each coat as it is applied and the dry film thickness of the entire system. Wet film thickness shall be measured with a gauge that will measure the wet film thickness within an accuracy of ± 0.5 mil . Dry film thickness shall be measured in accordance with SSPC-PA 2.

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3-6.04. Spark Testing. Not required.

3-6.05. Adhesion Testing. Not required.

3-7. FIELD PRIMING SCHEDULE. In general, steel and cast iron surfaces of equipment are specified to be shop primed. Any such surfaces which have not been shop primed shall be field primed. Damaged or failed shop coatings which have been determined unsuitable by Engineer shall be removed and the surfaces shall be field coated, including prime coat (if any). Galvanized, aluminum, stainless steel, and insulated surfaces shall be field primed. Primers used for field priming, unless otherwise required for repair of shop primers, shall be:

<u>Surface To Be Primed</u>	<u>Material</u>
Equipment, surfaces to be coated with	
Aliphatic polyurethane	Universal primer.
Epoxy	Same as finish coats.
Coal tar coating	Same as finish coats.
Vinyl ester	Same as finish coats.
Steel and cast iron, surfaces to be coated with	
Epoxy	Same as finish coats or inorganic zinc.
Coal tar coating	Same as finish coats.
Aluminum	Epoxy.
Galvanized	Epoxy.
Copper	Epoxy.
Stainless steel	Epoxy.
Plastic surfaces, including PVC and FRP	Same as finish coats.
Insulated piping	As recommended by manufacturer of finish coats.
Concrete, surfaces to be coated with epoxy	
For damp-proofing	Epoxy.
For all other surfaces	Epoxy concrete filler and surfacer.
Concrete block exposed in exterior locations	Epoxy concrete block filler.
Concrete block to be coated with epoxy	Epoxy concrete block filler.

Unless otherwise recommended by the coating manufacturer or specified herein, priming will not be required on concrete, or concrete block, nor on metal surfaces specified to be coated with coal tar epoxy, and heat-resistant coatings. Concrete

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surfaces to be coated with epoxy shall be filled with epoxy concrete filler and surfacer so that a continuous film is obtained, except where concrete is damp-proofed with epoxy.

3-8. FINISH COATING SYSTEMS. The following schedule lists coatings systems and coating surface designations. See Article 1-3 for a definition of the surface designations.

No.	Finish Coating Systems	Coating Surface Designation						
		A	C	E	F	G	H	P
1.	Epoxy – One coat	x			x	x		
2.	Epoxy – Two coats	x	x	x	x	x		x
3.	Epoxy / NSF – Two coats		x	x				
4.	Epoxy – Three coats	x	x	x				
5.	Epoxy / NSF – Three coats	x	x	x				
6.	Epoxy – First coat Aliphatic polyurethane – Finish coat	x	x	x	x	x		x
7.	Epoxy – First and second coat Aliphatic polyurethane – Finish coat	x	x	x	x	x		
8.	Universal primer – First coat Aliphatic polyurethane – Finish coat	x		x				
9.	Medium consistency coal tar – Two coats	x	x	x				
10.	Coal tar epoxy – Two coats	x	x	x				
11.	Vinyl ester – Two coats	x	x	x				
12.	Heat resistant – Two coats							
13.	High heat resistant – Two coats							
14.	Zinc primer – First coat Epoxy – Intermediate coat Aliphatic polyurethane – Final coat	x		x				
15.	Flake-filled epoxy	x		x				

3-8.01. Surfaces Not To Be Coated. Unless otherwise specified, the following surfaces shall be left uncoated:

- Exposed aluminum, except ductwork.
- Polished or finished stainless steel. Unfinished stainless steel, except flashings and counter flashings, shall be coated.
- Nickel or chromium.
- Galvanized surfaces, except piping, conduit, ductwork, and other items specifically noted.
- Rubber and plastics, except as specified.
- Exterior concrete.
- FRP.
- Surfaces specified to be factory finished.

3-8.02. Shop Finishing. Items to be shop finished include the following. Shop finishing shall be in accordance with the coating manufacturer's recommendations.

- a. Surfaces where blast cleaning cannot be or is not recommended to be performed in the field.
- b. Other items as otherwise specified.

3-8.03. Field Coating. Items to be field coated include the following. Field coating shall be in accordance with the field priming schedule, the coating schedule, and the manufacturer's recommendations.

- a. Surfaces not indicated to be shop finished and surfaces where blast cleaning can be performed in the field.
- b. Other items as otherwise specified.

3-9. METAL SURFACES COATING SCHEDULE.

<u>Surface To Be Coated</u>	<u>Finish Coating System</u>
Non-galvanized structural and miscellaneous steel exposed to view or to the elements in exterior locations.	A14
Non-galvanized structural and miscellaneous steel exposed to view inside buildings.	A2
Steel handrails, steel floor plates .	A8
Unless otherwise specified, pumps, motors, speed reducers, and other machines and equipment exposed to view.	E8

<u>Surface To Be Coated</u>	<u>Finish Coating System</u>
Actuator surfaces for valves, unless factory finished.	Outdoor – E7 , Indoor – E8
Electrical equipment cabinets, and similar items and equipment (unless factory finished) exposed to view.	E8
Cast Iron and steel piping above grade exposed to the elements and to view outdoors, including piping to be insulated, valves, fittings, flanges, bolts, supports, and accessories, and galvanized surfaces after proper priming.	A7
Copper pipe and tubing, including fittings and valves exposed to view in exterior locations.	F7
Supports and miscellaneous metal for equipment handling corrosive chemicals.	Outdoor – A7 Indoor – A2
Aluminum in contact with concrete.	F1
Aluminum and galvanized ductwork and conduit indoors.	F2 or G2
Aluminum and galvanized ductwork and conduit exposed to elements outdoors.	F7 or G7
Aluminum materials exposed to the elements outdoors.	F7

3-10. CONCRETE AND MASONRY SURFACES COATING SCHEDULE.

<u>Surface To Be Coated</u>	<u>Finish Coating System</u>
All existing outdoor concrete floors and walls, and new concrete cores within the Area 60 tank farm containment basins	See Corrosion Protection Lining Systems
All existing indoor concrete coatings damaged or requiring repair, and new concrete for pump bases in the Area 60, 76 and 80 pump room containment basins	See Corrosion Protection Lining Systems

New concrete encasement for electrical conduits in the Area 60 tank farm

See drawings for required waterproofing prior to final Corrosion Protection Lining System

All new concrete in corrosive areas (Except floors and surfaces scheduled to receive other coatings) which are exposed to view and not specified elsewhere.

Indoor –C2
Outdoor –C7

Where indicated on the Drawings, walls, floors, and curbed areas, adjacent to corrosive chemical storage and feed equipment.

C2

3-11. MISCELLANEOUS SURFACES COATING SCHEDULE.

Plastic Surfaces, including PVC pipe.

Outdoor – P6
Indoor – P2

3-12. PIPING IDENTIFICATION SCHEDULE. Exposed piping and piping in accessible chases shall be identified with lettering or tags designating the service of each piping system, marked with flow directional arrows, and color coded.

Piping scheduled to be color coded shall be completely coated with the indicated colors, except surfaces specified to remain uncoated shall include sufficiently long segments of the specified color to accommodate the lettering and arrows. All other piping shall be coated to match adjacent surfaces, unless otherwise directed by Engineer.

3-12.01. Location. Lettering and flow direction arrows shall be provided on pipe near the equipment served, adjacent to valves, on both sides of wall and floor penetrations, at each branch or tee, and at least every 50 feet in straight runs of pipe. If, in the opinion of Engineer, this requirement will result in an excessive number of labels or arrows, the number required shall be reduced as directed.

3-12.02. Metal Tags. Where the outside diameter of pipe or pipe covering is 5/8 inch or smaller, aluminum or stainless steel tags shall be provided instead of lettering. Tags shall be stamped as specified and shall be fastened to the pipe with suitable chains. Pipe identified with tags shall be color coded as specified.

3-12.03. Lettering. Lettering shall be painted or stenciled on piping or shall be applied as snap-on markers. Snap-on markers shall be plastic sleeves, Brady "Bradysnap-On B-915", Seton "Setmark", or equal. Letter size shall be as follows:

<u>Outside Diameter of Pipe or Covering</u>	<u>Minimum Height of Letters</u>
5/8 inch and smaller	Metal tags -1/4 inch
3/4 to 4 inches	3/4 inch
5 inches and larger	2 inches

3-12.04. Color Coding and Lettering. All piping for the following services shall be color coded. Bands shall be 6 inches wide spaced along the pipe at 5 foot intervals. For services not listed, the color coding and lettering shall be as directed by the Engineer.

Piping Identification		
Service	Color of Pipe	Color of Letters
Ferric Chloride – Area 60	Yellow	Black
Ferrous Chloride – Area 60	Yellow	Black
Ferrous Chloride - Area 80	Orange	Black
Polymer – Area 60	Yellow	Black
Potable Water - Area 60 Eyewash/Showers	Green	White
Sodium Hypochlorite – Area 60	Yellow	Black
Sodium Hydroxide (caustic) – Area 60	Yellow	Black
Sulfuric Acid – Area 60	Yellow	Black
Plant Air	White	Black
Fire Protection Water	Red	White
Plumbing Vents	Dark gray	White
Process Water	Purple	White

In addition, special coating of the following items will be required:

<u>Item</u>	<u>Color</u>
Valve handwheels and levers	Red

Numerals at least 2 inches high shall be painted on or adjacent to all accessible valves, pumps, flowmeters, and other items of equipment which are identified on the Drawings or in the Specifications by number.

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SURFACE DESCRIPTION	SYSTEM NO. -

SURFACE PREPARATION DESCRIPTION
<input type="checkbox"/> Solvent SSPC-SP1 <input type="checkbox"/> Ferrous Metal Nonimmersion SSPC-SP6 <input type="checkbox"/> Ferrous Metal Immersion <ul style="list-style-type: none"> <input type="checkbox"/> SSPC-SP10 <input type="checkbox"/> SSPC-SP-5 <input type="checkbox"/> Other

COATING	DFT mils	MANUFACTURER AND PRODUCT
First Coat (Primer)		
Second Coat		
Third Coat		
Total System		Not less than minimum thickness specified.

Notes: (Attached if needed.)

Project: MBC CHEMICAL SYSTEMS IMPROVMENTS – PHASE II		
Coatings Manufacturer:		Initials _____
Painting Applicator:		Initials _____
CITY OF SAN DIEGO	COATING SYSTEM DATA SHEET	Fig 1-09940

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COATING SYSTEM DATA SHEET
SECTION 09940-FIGURE 1

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COATING SYSTEM DATA SHEET
SECTION 09940-FIGURE 2

SHOP PRIMED SURFACE DESCRIPTION	SYSTEM NO. -	-F

SURFACE PREPARATION DESCRIPTION
<input type="checkbox"/> Solvent SSPC-SP1 <input type="checkbox"/> Other:

COATING	DFT mils	MANUFACTURER AND PRODUCT
Shop (Primer)		(Identify Product/Type)
Touchup		
Intermediate Coat		
Finish Coat		
Total System		Not less than minimum thickness specified.

Notes: (Attached if needed.)

Project: MBC CHEMICAL SYSTEMS IMPROVMENTS – PHASE II		
Coatings Manufacturer:		Initials _____
Painting Applicator:		Initials _____
CITY OF SAN DIEGO	COATING SYSTEM DATA SHEET	Fig 2-09940

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COATING SYSTEM DATA SHEET
 SECTION 09940-FIGURE 2

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COATING SYSTEM DATA SHEET
SECTION 09940-FIGURE 2

Section 11060

EQUIPMENT INSTALLATION

PART 1 - GENERAL

1-1. SCOPE. This section covers general installation requirements of new equipment units that have been purchased by Contractor as part of this Work. Equipment specific installation requirements are covered in the equipment sections.

1-2. 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.

Any existing equipment which is removed and salvaged for reinstallation shall be handled as indicated in the Demolition section.

1-2.01. Coordination. 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.

Flanged connections to equipment including the bolts, nuts, and gaskets are covered in the appropriate pipe specification section.

PART 2 - PRODUCTS

2-1. MATERIALS. Materials shall be as follows:

Grout	As specified in the Grouting section.
Anti-Seize thread lubricant for SS bolts	As specified in the Anchorage in Concrete and Masonry section.

PART 3 - EXECUTION

3-1. INSTALLATION. 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 the Startup Requirements section.

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EQUIPMENT INSTALLATION
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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.

Anti-seize thread lubricant shall be liberally applied to the threaded portion of all stainless steel bolts during assembly. For equipment installed in drinking water facilities, the anti-seize lubricant shall meet requirements of NSF-61.

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 installation by Contractor, and observe the tests indicated in the Startup Requirements section. The manufacturer's representatives will revisit the site as often as necessary to ensure installation satisfactory to Engineer.

All equipment shall be protected after installation, prior to final acceptance by Engineer. Protection provisions shall be as recommended by the manufacturer, and shall include provisions to prevent rust, mechanical damage, and foreign objects entering the equipment.

3-2. STARTUP AND TESTING. Startup requirements, and tests associated with startup shall be as indicated in the Startup Requirements section. 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.

3-2.01. Preliminary Field Tests. Preliminary field tests shall be conducted on all equipment by Contractor as indicated in the Startup Requirements section. 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 the Startup Requirements section and in the equipment sections.

3-2.02. Field System Operation Tests. Field system operation tests shall be conducted on all equipment by Contractor as indicated in the Startup Requirements section. 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 the Startup Requirements section and in the equipment sections.

3-2.03. Field Demonstration Tests. Field demonstration tests will be conducted by the equipment manufacturer on equipment as indicated and as specified in the equipment sections.

3-2.04. Field Performance Tests & Distribution Tests. Field performance tests or distribution tests will be conducted by the equipment manufacturer on equipment as indicated and as specified in the equipment sections.

3-2.05. Field Baseline Performance Tests. 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.

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EQUIPMENT INSTALLATION
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Section 11160

PROGRESSING CAVITY PUMPS

PART 1 - GENERAL

1-1. SCOPE. This section covers the furnishing of constant speed and adjustable speed progressing cavity type pumping units as specified herein.

Pump designation.	Mannich Polymer Transfer Pump
Number of pumps.	One (1)
Pump tag numbers.	60-P-11
Pump location.	Building 60

Each pumping unit shall be furnished complete with all accessories and appurtenances specified or otherwise required for proper operation.

Each pump and drive unit shall be mounted on a common baseplate as indicated on the Drawings.

Pump shall be Seepex brand, matching the two existing polymer transfer pumps (60-P-12, & 60-P-13) in flow and head requirements.

1-2. GENERAL. Equipment furnished under this section shall be fabricated and assembled in full conformity with Drawings, Specifications, engineering data, instructions, and recommendations of the equipment manufacturer, unless exceptions are noted by Engineer. Hydraulic considerations and definition of terms shall be as set forth in the Hydraulic Institute Standards.

1-2.01. 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.

1-2.02. Seismic Design Requirements. Seismic design requirements for products specified herein shall be as indicated in the Meteorological and Seismic Design Criteria section.

1-2.03. Dimensional Restrictions. Layout dimensions will vary between pump manufacturers and the layout area indicated on the Drawings is based on typical

values for progressing cavity pumps. The supplier shall review the Drawings, the pump manufacturer's layout drawings, and installation requirements and shall make any modifications required for proper installation subject to acceptance by Engineer. At least 3 feet of clear access space shall be provided on all sides of the pump.

1-2.04. Tagging. 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.

1-2.05. Power Supply. Unless otherwise indicated, power supply to the equipment shall be 480 volts, 60 Hz, 3 phase.

1-2.06. Identification. Pumps shall be identified in accordance with the Equipment and Valve Identification section.

1-3. SUBMITTALS.

1-3.01. Drawings and Data. Complete fabrication and assembly drawings, together with detailed specifications and data covering materials, drive unit, parts, devices, and accessories forming a part of the equipment furnished, shall be submitted in accordance with the Greenbook and Whitebook Submittals section. The data and specifications for each unit shall include, but shall not be limited to, the following:

Pumps

- Manufacturer.
- Type and model.
- Tag number.
- Pump designation.
- Type of joint.
- Pump speed at rated condition.
- Size of suction flange.
- Size of discharge flange.
- Maximum power requirement at maximum differential pressure condition.
- Complete performance curves at rated speed (and minimum speed for adjustable speed units).
- Net weight of pump and baseplate.
- Base and anchor bolt details.
- Data on shop painting.

Motors

- As specified in the Common Motor Requirements for Process Equipment section.

Seismic Design Requirements

Confirmation of compliance with the requirements of the Meteorological and Seismic Design Criteria section.

1-3.02. Operation and Maintenance Data and Manuals. Operation and maintenance manuals shall be submitted in accordance with the Greenbook and Whitebook Submittals section. The operation and maintenance manuals shall be in addition to any instructions or parts lists packed with or attached to the equipment when delivered.

1-4. QUALITY ASSURANCE.

1-4.01. Balance. 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 resonance at normal operating speeds is avoided. In any case, the unfiltered vibration displacement (peak-to-peak), as measured at any point on the machine, shall not exceed 5 mils.

At any operating speed, the ratio of rotative speed to the critical speed of a unit or its components shall be less than 0.8 or more than 1.3.

2-1 Polymer Pump. One pump shall be furnished and installed as indicated on the drawings to dispense diluted Mannich Polymer solution. The non-diluted polymer has a specific gravity of 1.1 and a viscosity of 40,000 cP. Diluted polymer is anticipated to range up to 5,000 cP.

The pump shall pump diluted Mannich Polymer under the following conditions and requirements:

Number of pumps	1
Equipment Number	60-P-11
Metering range, gpm	230
Maximum drive motor, hp	20
Maximum motor speed, rpm	1800
Nominal rotor maximum speed, rpm	252
Nominal discharge pressure, psi	35

The pump shall be of the progressing cavity type, constructed of materials selected for resistance to the pumped solution, at least Type 316 stainless steel and Viton rubber. The pump shall be heavy-duty, universal pin joint type. Each pump shall have a minimum two stage chemically resistant stator. The pump and drive shall be mounted on a structural steel baseplate complete with a drip rim, a drainage connection, and suitable guards.

The pump shall have a stable head-capacity curve and be free from cavitation and objectionable noise. Pumping heads and other terms shall be as defined in the Hydraulic Institute Standards.

Suction and discharge nozzles shall have ANSI Class 150 pound flanges and shall be tapped and plugged for a pressure gauge connection. The pump shall be furnished with a stuffing box and a packing gland-type seal of Teflon construction. The pump shall be arranged for side suction and end discharge.

The pump shall be provided with a high discharge pressure switch and a pressure switch isolator, to stop the pump on excessive discharge pressure. Pressure switches shall have an adjustable operating range of 5 to 150 psig, safe to 200 psig surge, manual reset, with a minimum 10 ampere, 120 volt contact rating.

One pressure gauge with isolating diaphragm shall be furnished for installation in the discharge piping of each pump, as indicated on the Drawings. The pressure gauge shall be indicating dial type with adjustable pointer and acrylic plastic or shatterproof glass window. The dial shall be 4-1/2 inches in diameter, with white background and black markings. Pointer travel shall be approximately 270 degrees. The unit of measurement shall be pounds per square inch, and shall be indicated on the dial face. The gauge shall be selected so that gauge readings will be mid-scale under normal operating conditions. The isolating diaphragm shall protect the pressure gauge from the chemical solution.

Each pump shall be equipped with an AC motor suitable for operation from a 480 volt, 60 Hz, three phase power supply. Motor horsepower for each pump shall be based on the above requirements and on the discharge back pressure required by the pump furnished.

The transfer pump shall be Seepex, and shall match that of the two existing pumps (60-P-12, & 60-P-13). The existing pumps are Type 70-6L BN. The products of other manufacturers are not acceptable.

PART 3 - EXECUTION

3-1. INSTALLATION. Each pumping unit shall be installed in accordance with the Hydraulic Institute Standards, the Equipment Installation section, and as specified herein.

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.

Couplings shall be realigned after grouting. Final coupling mis-alignment shall be within one-half of the coupling manufacturer's allowable tolerance.

3-2. FIELD QUALITY CONTROL.

3-2.01. Installation Check. An installation check by an authorized representative of the manufacturer is not required. An experienced, competent, and authorized representative of the manufacturer shall visit the site of the Work and inspect, check, adjust if necessary, and approve the equipment installation. The representative shall be present when the equipment is placed in operation in accordance with the Start-up Requirements section, and shall revisit the job site as often as necessary until all trouble is corrected and the equipment installation and operation are satisfactory in the opinion of Engineer.

The manufacturer's representative shall furnish a written report certifying that the equipment has been properly installed and lubricated; is in accurate alignment; is free from any undue stress imposed by connecting piping or anchor bolts; and has been operated under full load conditions and that it operated satisfactorily.

All costs for these services shall be included in the contract price. Contractor shall include a minimum of 1 day and 1 trip to the site.

3-2.02. Installation Supervision. Installation supervision by the manufacturer is not required. The equipment manufacturer shall furnish a qualified field installation supervisor during the equipment installation. All costs for these services shall be included in the contract price. Contractor shall include a minimum of 1 day and 1 trip to the site.

Manufacturers' installation supervisor shall observe, instruct, guide, and direct the installing contractor's erection or installation procedures.

End of Section

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Section 11727

LIQUID CHEMICAL FEED SYSTEMS

PART 1 - GENERAL

1-1. SCOPE. This section covers liquid chemical feed equipment and accessories. Principal items to be furnished and installed shall include the following:

Ferrous Chloride Feed System.

Three metering pumps (two existing and one new).
Three calibration columns.
Three flowmeters.

For the ferrous chloride feed system, the two existing pumps shall be reused and relocated as shown in the Drawings. The Contractor shall procure a new (third) pump to match the two existing pumps as specified in this Section.

The following items of work and equipment are covered under other sections:

Piping and valves between items of equipment.
Electric power supply to the equipment.

1-2. SYSTEM INTEGRATOR. The chemical feed systems shall be designed, coordinated, and supplied by a competent System Integrator. The System Integrator shall be regularly engaged in the business of designing and assembling liquid chemical feed systems for water treatment or wastewater treatment plant projects. The System Integrator shall be responsible for ensuring that a complete functioning system is supplied for each Chemical Feed System. The System Integrator shall be responsible for coordinating all equipment, piping, and valves, and appurtenances for each Chemical Feed System.

1-2.01 System Integrator Qualifications. The System Integrator shall meet all of the following requirements and within 30 days after the Notice of Award, the Contractor shall submit proof of the following qualifications for the intended System Integrator:

The System Integrator has successfully provided similar work for at least 5 years.

The names of at least three references who are users of similar systems designed, assembled, and furnished by the System Integrator.

The System Integrator has the required financial capability.

The names of manufacturers whose products will be supplied.

The System Integrator maintains a qualified technical staff and design office.

The System Integrator has the physical plant and fabricating personnel to complete the work specified.

The System Integrator has and will maintain competent service personnel to service the equipment furnished.

1-3. GENERAL. Equipment furnished and installed under this section shall be fabricated, assembled, 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 the Engineer.

Each item shall be furnished and installed complete with all mechanical and electrical equipment required for proper operation, all components indicated on the drawings or specified, and all additional materials or construction required by the design of the system.

1-3.01. Coordination. The System Integrator shall verify that each system component is compatible and consistent with all other components of the system, that all pipe materials and sizes are appropriate, and that all devices necessary for a properly functioning system have been provided. Devices and appurtenances necessary for a properly functioning system shall be constructed of materials consistent with the piping materials unless otherwise indicated. The System Integrator shall assume responsibility for ensuring that Minimum Suction Head and NPSH available is adequate for the supplied pumps.

Similar components of different chemical feed systems shall be from the same manufacturer to facilitate maintenance and stocking of repair parts. Whenever possible, identical units shall be furnished.

Review of drawings submitted prior to the final determination and coordination of related equipment to be provided will not relieve the Contractor from responsibility for supplying systems in full compliance with the specific requirements of the related equipment.

1-3.02. General Equipment Stipulations. The General Equipment Stipulations shall apply to all equipment furnished under this section. Piping on skids shall be constructed consistent with the piping and valve specifications.

1-3.03. Governing Standards. All electrical equipment shall conform to applicable standards of the National Electrical Manufacturers Association and the National Electrical Code.

1-3.04. Power Supply. Unless otherwise specified, the power supply will be 120 volts, 60 Hz, single phase. Where control voltage lower than the power supply voltage is required, a suitable control power transformer shall be furnished. Both power and control equipment shall be insulated for not less than 600 volts even though operating voltages may be lower.

1-3.05. Metal Thicknesses. Metal thicknesses and gauges specified herein are the minimum required. Gauges refer to US Standard gauge.

1-3.06. Nameplates. A nameplate shall be provided and mounted on or adjacent to each piece of chemical feed equipment to identify its function. Nameplates shall be approximately 1 by 3 inches, made from black on white phenolic material. Letters shall be engraved to the white interior and shall be at least 3/16-inch high. Feeder designations on the nameplates shall correspond to those indicated on the drawings.

1-3.07. Spare Parts. A list of recommended spare parts with pricing shall be furnished during the submittal phase.

1-4. SUBMITTALS. Submittals for chemical feed systems shall have the following organization and information as a minimum.

1-4.01. Submittal organization. The submittal shall be split up into different sections with a separate section for each chemical feed system. Each system section shall be supplied with the following information.

System Integrator Name, Contact Name, Phone Number, Address, and email address.

System Integrator Contact Name Qualifications and Experience

Bill of Materials

System piping and instrumentation diagram (P&ID) with legend

Equipment and piping layout starting from bulk storage tank pump suction nozzle to discharge of anti-siphon loop.

Metering pump selections

Metering pump appurtenances including calibration column

Magnetic flowmeter selections

Control narrative.

Spare parts

1-4.02. Drawings and Data. Complete fabrication, assembly, installation and equipment and piping layout drawings, piping and instrumentation diagrams, and wiring 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 Greenbook and Whitebook Submittals Section.

1-4.03. Calibration Graphs. The System Integrator shall prepare a calibration graph from field tests for each chemical feed pump. Each graph shall include a curve of pump speed versus gallons per hour at 10, 25, 50, 75 and 100 percent speed. Each graph shall be furnished on hard paper and sealed in clear plastic.

1-4.04. Control Narrative. A narrative description of the proposed metering pump controls, including all control modes, automatic operations, electrical interlocks, alarms, and interfaces to the Plant Control System shall be submitted. Control strategies for the existing chemical feed systems, including changes to be made for these improvements are included in Appendix A of Section 13300. The current ferrous chloride system control strategy (No. 16) with proposed modifications is included in these specifications and shall be reviewed and revised as necessary by the Contractor for review and approval by the Engineer and Owner.

PART 2 - PRODUCTS

2-1. SYSTEM INTEGRATOR. The chemical feed system shall be coordinated, and supplied by a qualified System Integrator who is regularly engaged in the business of designing and assembling liquid chemical feed systems for water treatment or wastewater treatment plant projects.

2-2. CONSTRUCTION. Chemical feed equipment shall be of substantial construction with all parts designed for long life under working conditions including corrosive atmospheres and intermittent or continuous operation. All

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wearing parts and items requiring adjustment shall be readily accessible. Each unit shall be completely enclosed and dust tight when in operation. All parts which are exposed to corrosive conditions shall be made from corrosion-resistant materials or covered with suitable protective coatings.

2-3. FERROUS CHLORIDE FEED SYSTEM. One assembly of feeding equipment shall be furnished and installed to dispense ferrous chloride to the following feed points:

- Digester No. 1
- Digester No. 2
- Digester No. 3

2-3.01. Quick Connect Adapters. Not used.

2-3.02. Metering Pumps. One new metering pump shall be furnished by the Contractor. The two existing metering pumps shall be utilized in the improvements. These three metering pumps (one new, two existing) shall be installed as indicated on the Drawings to dispense 35 percent ferrous chloride with a specific gravity of 1.35 to the Digesters No. 1, No. 2, and No. 3.

Each pump shall include continuous local and remote electric and local manual mechanically controlled metering of solution under the following conditions and requirements.

Designation	80-P-80 (exst), 80-P-81 (exst), 80-P-82 (new)
Number of pumps	Three (3) (Two existing, One New)
Capacity control range, percent	0 to 100
Flow capacity, gpm	0.0003 to 4.75 (To match the existing pumps)
Tubing bore	To match existing pumps
Nominal discharge pressure, psi	To match existing pumps

Motor horsepower for each pump shall be based on the above requirements and on the discharge back pressure required by the pump furnished. Motor shall not be less than the indicated horsepower.

Pumps shall be of the positive displacement peristaltic type, utilizing a flexible tube and spring loaded track. Each pump shall consist of a pump head cover with safety interlock switch, ratchet type retainer mechanism, and gear driven roller rotor assembly with integral speed drive. The magnetic interlock switch shall render the drive inoperable when opened.

The process fluid shall only be in contact with the inside of the pump tubing. The pump tubing shall be constructed of material chemically resistant to the pumped solution, as acceptable to the Engineer. The pump shall be capable of accepting five tube diameters to increase capacity range. The tubing shall have a wall thickness of 3/16". A 10-foot section of replacement tubing shall be provided for each of the three pumps (two existing, one new) for future use by Owner Personal.

The tubing shall be in contact with the inside diameter of the track (housing) through an angle of 90° and shall be held in place on the suction and discharge by hand operated ratcheted clamps. Tube clamps requiring tools will not be acceptable. Tubing replacement shall not require the use of tools.

The rotor assembly shall be equipped with four self-lubricating geared compression rollers driven by a 4:1 planetary gear reducer. Compression rollers shall be supported by roller bearings on a shaft mounted to the end plates of the rotor assembly. Compression rollers shall be located 90° apart for compression of the hose against the track four times per revolution. One roller shall be fully engaged with the tubing at all times, providing complete compression to prevent back flow or siphoning. Hose occlusion shall be adjustable by the adjustment of two knurled nuts with springs that set the force with which the cover will bear down upon the tubing. The knurled nuts shall be fitted with set screws to limit compression.

Each rotor assembly shall be mounted on roller bearings to a drive shaft supported between roller bearings mounted in the pump housing. The assembly will engage the drive shaft by means of a gear that shall directly drive each roller independently. The drive shaft shall engage the drive motor through a timing belt and pulley system.

Each pump shall be completely self priming with a suction lift capability of up to 30 feet of water. The pump shall be capable of running dry without damaging effects to the pump or hose. The pump shall be valveless and without diaphragms and shall not utilize any dynamic seals in contact with the pumpage.

Flow through the hose shall be in the direction of the rotor rotation, and shall be capable of being reversed.

Each pump (three total) shall be furnished with the following accessories. All metering pump suction and discharge appurtenances described below and branch piping to these appurtenances shall be the same sizes as the suction and discharge piping indicated on the Drawings.

One transparent PVC bodied Y-pattern strainer with 12-mesh screen and O-ring seals.

One pressure gauge with isolating diaphragm. The pressure gauge shall be indicating dial type with adjustable pointer and acrylic plastic or shatterproof glass window. The dial shall be 4-1/2 inches in diameter, with white background and black markings. Pointer travel shall be approximately 270 degrees. The unit of measurement shall be pounds per square inch, and shall be indicated on the dial face. The gauge shall be selected so that gauge readings will be mid-scale under normal operating conditions. The isolating diaphragm shall protect the pressure gauge from the chemical solution.

One external pressure relief valve sized to pass the maximum displacement of the pump. The pressure setting shall be as recommended by the pump manufacturer. Pressure relief valve shall be constructed of CPVC and shall use socket weld connections.

One leak detection device shall be provided to detect a tubing failure by sensing the pressure of the liquid inside of the pump head, and shall alarm and stop the pump.

Two Loadsure™ element tubings for each pump (one suction and one discharge), plus six additional spares (twelve total tubes). Loadsure™ element tubing shall match the existing tubing size, and shall be approximately 2-feet in length to match existing. Tubing material shall be compatible for chemical pumped. Loadsure™ tubing camlocks shall be provided on both ends of the tubing, as well for mating to the suction and discharge hard piping (six locations) .

Metering pumps shall be Watson-Marlow Bredel Pumps "Model Series 620DuN/RE".

2-3.02.01. Metering Pump Drive Units. The pump shall be supplied with a case-drive integral reversible servo permanent magnet dc drive motor with internal gearbox to accept 120 volts ac, 60 Hz, single phase. Housing shall be pressure cast aluminum with Alocrom pre-treatment and exterior grade corrosion resistant

polyester powder coat. Unpainted housings, including 316SS, shall not be acceptable. Each pump shall not consume in excess of 790 VA. Drive unit shall be classified for continuous heavy shock duty, AGMA. Each drive unit shall be furnished with a grounded power cord and plug suitable for plugging into a standard grounded 120-volt receptacle. Power cord conductor size shall be #12 AWG minimum for both power and ground. The connection between the power cord and the drive unit shall be as recommended by the manufacturer.

The drive motor shall be capable of varying the speed of the pump to deliver the metering range in gpm or gph as specified. The drive shall be provided with an "On-Off-Remote" selector switch for control of the pump. In the "On" position, the pump shall be operated by Start and Stop pushbuttons, and the speed of motor shall be varied by a manual speed adjustment on the pump. In the "Remote" position, the pump shall be started by a remote input dry contact. Pump speed shall be varied by a remote input 4-20 mA signal. The drive shall provide an output 4-20 mA speed signal for remote monitoring. Contacts for pump "running", "In Remote" selector switch position, and pump "Fail" shall be provided for remote monitoring. The "Fail" contact shall include leak detected, and drive failure.

2-3.03. Calibration Columns. Three transparent plastic calibrating columns shall be furnished and installed on the pump suction piping as indicated on the Drawings. The column shall be a 3-inch ID clear PVC or other resistant, rigid, transparent plastic tubing having a vented top cap and 1-inch screwed flow fitting. Each column shall be graduated in 0.05 gallon increments over a range of 0 to 0.7 gallons, complete with a numeral at each graduation. The bottom of the calibration column shall be located at or below the bottom of elevation of the storage tank metering pump suction nozzle. The columns shall be Valcom, Inc., "Model 8500", or equal, and shall be mounted on PVC legs.

2-3.04. Magnetic Flowmeters. Three magnetic flowmeters shall be furnished and installed (one for each digester) on the discharge side of the metering pumps as indicated on the Drawings. Each magnetic flowmeter shall be a completely obstructionless, in-line flowmeter with no constrictions in the flow of fluid through the meter. Each meter shall consist of a metallic tube with flanged ends and with grounding rings or grounding electrodes as required by the application. Flange diameter and bolt drilling pattern shall comply with ANSI/ASME B16.5 for line sizes from one-half inch to 24 inches. Flange class ratings and meter maximum pressure ratings shall be compatible with the adjoining piping. Self-cleaning electrodes shall be provided for all meters used for sludge metering. Electrode and liner materials shall be fully compatible with the process fluid as approved by the Engineer. Stainless steel is not acceptable. Each meter shall be factory wet flow calibrated to the sensors full flow capacity, at a facility, which is traceable to NIST or other standard acceptable to Engineer, and a copy of the calibration,

report shall be submitted as part of the operation and maintenance manual submittal.

The meter shall be capable of standing empty for extended periods of time without damage to any components.

Each flow meter shall be sized as shown below:

Designation	80FE/FIT-2725	80FE/FIT-2730	80FE/FIT-2735
Quantity	One	One	One
Capacity, gallons per minute	5	5	5

Each flowmeter shall be sized as recommended by the flowmeter manufacturer.

The meter housing shall be of a splash-proof and drip-proof design.

Meters shall be as manufactured by ABB, Endress + Hauser, Foxboro, Krohne, Rosemount, or Siemens.

2-3.04.01. Magnetic Flow Meter Signal Converter. Integral or separately mounted, microprocessor-based signal converters shall be provided for each magnetic flowmeter. Each signal converter shall include output damping, self-testing, built-in calibration capability, and an "empty pipe zero" contact input. The overall accuracy of the magnetic flowmeter transmitter and signal converter shall be ± 0.5 percent of actual flow rate for full-scale settings of 3 to 30 fps. The meter manufacturer shall furnish the signal cable between the converter and the magnetic flowmeter. The signal converter shall be housed in a corrosion-resistant, weatherproof NEMA Type 4X housing and shall be suitable for operation over an ambient temperature range of -30 to $+140^{\circ}\text{F}$, and relative humidity of 10 to 100 percent. The converter shall have an analog output of 4-20 mA dc. When required, the converter shall also have a pulse output designed to operate a remote totalizer or predetermining counter. Transmitters shall contain a local indicator with a minimum four digit LCD type display, scaled to read in engineering units of flow.

Magnetic flowmeter systems shall provide zero flow stability by means of automatic zero adjustment of a DC excited metering circuit. Signal converters shall be of the same brand as the magnetic flowmeters.

The signal converter shall have a non-reset seven-digit, or a manually reset six-digit, totalizer on the face of the enclosure.

PART 3 - EXECUTION

3-1. INSTALLATION. Equipment and materials furnished under this section shall be installed in proper operating condition in full conformity with Drawings, specifications, and recommendations of the equipment manufacturer, unless exceptions are noted by the Engineer. All items necessary for a complete operating system shall be installed.

3-1.01. Equipment Bases. Unless otherwise specified or indicated on the Drawings, each item of chemical feed equipment shall be mounted on a concrete base approximately six inches above the floor. If feeders or other components must be supported at higher elevations above the floor, suitable supplementary bases shall be provided. For the ferrous chloride feed pumps in Area 80, pumps shall be installed on two structurally sound Unistrut or equal pump racks similar to existing. Racks shall be attached to the existing concrete base, and pumps shall be attached to the top of the rack.

3-1.02. Installation Check. An experienced, competent, and authorized representative of the System Integrator shall visit the site of the Work and inspect, check, adjust if necessary, and approve the equipment installation. The representative shall be present when equipment is placed in operation in accordance with Section 01650 and 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.

The System Integrator's representative shall furnish a written report certifying that the equipment has been properly installed; that gas piping has been properly cleaned; is in accurate alignment; is free from undue stress imposed by connecting piping or anchor bolts; and has been operated at full load conditions and that it operated satisfactorily.

All costs for these services shall be included in the contract price for the number of days and round trips to the site as required.

3-2. CLEANING. At the completion of installation and 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 at no additional cost to Owner.

3-3. TRAINING. The System Integrator shall provide a qualified representative at the jobsite for at minimum one day (8 hour day) to train the Owner's personnel in operating and maintaining the equipment.

All costs for these services shall be included in the contract price for the number of days and round trips to the site as required.

End of Section

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Section 13300

INSTRUMENTATION AND CONTROL

PART 1 -- GENERAL

1.1 WORK OF THIS SECTION

The WORK of this Section includes the general specification and requirements for the instrumentation and control WORK under this and other applicable Specifications. The WORK also includes providing instrumentation and all related wiring as shown in these Contract Documents. The WORK performed shall be compatible with the existing control systems at the Metro Biolsolids Center. Some information contained in this section is for informational use only in order for the Con to understand the existing systems in place.

The Contractor shall be responsible for the design, procurement, installation, testing, training, and documentation for instrumentation and control systems provided under this Contract. The Contractor shall be responsible for interfacing with the existing MBC distributed control system (DCS) components, including installing and terminating DCS inputs and outputs (I/O), providing power, and for installing and testing all equipment.

Per the Greenbook and Whitebook Submittal section, the Contractor shall be responsible for providing instrument submittals to be used in the generation of panel wiring diagrams and loop drawings which depict the interconnection between instruments, panels, valve actuators, MCCs, and the DCS. The Contractor shall generate complete loop drawings for each measuring or control loop. Example loop drawings representing the format required by the City have been provided in the Contract Drawings, and shall be utilized as a guide for the Contractor in development of the MBC loop drawings.

All control system field tests including loop tests, plant commissioning, and plant startup, shall be the responsibility of the Contractor. The Contractor shall provide competent personnel including electrical engineer, I&C engineer, and process engineer during all field tests. The Contractor shall be responsible for providing field and control room personnel to witness the simulation of field inputs associated with the DCS I/O. The Contractor shall be responsible for providing all competent personnel and NIST certified, current within a year, equipment (current drivers, jumpers, read out devices, oscilloscopes, voltage-resistance meters, etc.) required to perform the loop test simulations. All devices used shall be traceable to the National Institute of Standards and Technology (NIST).

The Contractor shall perform field engineering design as required for mounting and supporting all field mounted components. The Contractor shall develop any additional schematic and interconnection diagrams which may be required for complete and operable instrumentation.

The Contractor shall secure the services of an I&C Subcontractor who acting through the Contractor shall provide all components, system installation services, as well as all required and specified ancillary services in connection with the I&C system. The system includes all materials, labor, tools and documentation required to furnish, install, test and place in operation a complete and operable I&C system as shown and/or specified in the contract drawings. The I&C Subcontractor shall coordinate with the City to provide a complete, integrated and operable DCS system as the City will be performing DCS programming. The Subcontractor's role shall include, but is not limited to, witnessing the functional testing of all control loops ensuring instruments and wiring for each loop have been correctly installed. The I&C Subcontractor shall also ensure, amongst other tasks that, all wires are correctly numbered, drawings are correctly updated and within the required time frame and that all parties concerned work to the project time line to meet project milestones. During commissioning the Subcontractor shall coordinate between the relevant subcontractors to ensure that the necessary stage of completion is reached by all involved parties and all functional tests have been performed by all involved parties and all functional tests have been performed satisfactorily before that particular phase of the project is scheduled for commissioning. This shall include polarity and functional tests of all field devices, all data communication links are functional and all devices being controlled and monitored are adequately represented on the graphic display including any associated functions, which may be required.

1.2 RELATED SECTIONS

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.

Section 09940 Protective Coatings

Division 11 Equipment, as applicable

Division 15 Mechanical, as applicable

Division 16 Electrical, as applicable

1.3 CODES

WORK of this Section shall comply with the current editions of the following codes as adopted by the City of San Diego Municipal Code:

Uniform Fire Code

National Electrical Code

1.4 SPECIFICATIONS AND STANDARDS

Except as otherwise indicated, the current editions of the following apply to the WORK of this Section:

ANSI/ASME B 16.5	Pipe Flanges and Flanged Fittings
API RP-550	Manual on Installation of Refinery Instruments and Control Systems, Part 1 - Process Instrumentation and Control Sections 1 Through 13
ASTM A 105	Specification for Forgings, Carbon Steel for Piping Components
ASTM A 193	Specification for Alloy Steel and Stainless Steel Bolting Materials for High Temperature Service
ASTM A 194	Specification for Carbon and Alloy Steel Nuts for Bolts for High Pressure and High Temperature Service
ASTM A 283	Specification for Low and Intermediate Tensile Strength Carbon Steel Plates, Shapes, and Bars
ASTM A 312	Stainless Steel Piping
ISA-RP60.6	Nameplates, Labels, and Tags for Control Centers
ISA-RP7.1	Pneumatic Control Circuit Pressure Test
ISA-RP12.6	Installation of Intrinsically Safe Systems for Hazardous (Classified) Locations
ISA-S5.1	Instrument Symbols and Identification
ISA-S5.4	Instrument Loop Diagrams
ISA-S12.4	Instrument Purging for Reduction of Hazardous Area Classification
ISA-S20	Specification Forms for Process Measurement and Control Instrumentation; Primary Elements and Control Valves
ANSI - B16.1	Cast Iron Pipe Flanges and Flanged Fittings, Class 25, 125, 250, and 800
ANSI/AWWA C207	Steel Pipe Flanges for Waterworks Service - Sizes 4 In Through 144 In.

ANSI/AWWA C701	Cold-Water Meters - Turbine Type for Customer Service
ANSI/AWWA C702	Cold-Water Meters - Compound Type
AWWA C704	Cold-Water Meters - Propeller Type for Main Line Applications
ASTM A 126	Specification for Gray Iron Castings for Valves, Flanges and Pipe Fittings
ASTM B 61	Specification for Steam or Valve Bronze Castings
ANSI/AWWA	Ductile-Iron and Gray-Iron Fittings, 3-In Through C110/A21.10 48-In for Water and Other Liquids
ASME REPORT	Fluid Meters, Sixth Edition, 1971

1.5 SHOP DRAWINGS AND SAMPLES

Shop Drawings:

General: Complete drawings, details, and specifications covering the instrumentation, controls and their appurtenances shall be submitted in accordance with the Greenbook and Whitebook Submittal section.

Submittals: Electronic copies of drawings shall be provided in Microstation, compatible with City of San Diego standards. At minimum, the following drawings shall be submitted:

- P&IDs
- Loop Drawings

Loop Diagrams: loop diagrams shall conform to ISA 5.4 to verify the DCS interfaces with all instrumentation and devices being provided or installed under the project. The loop diagrams shall also define all interfaces with equipment provided by area Contractors. Format shall match that of the examples provided.

DCS I/O tag numbers will generally reflect the device tag number. Each I/O tag number will be unique. The tag prefix will be based on ISA-5.4, with the following additional special acronyms:

Acronym	Signal Use
YL	Ready Signals/ Status
ZL	In Computer status

ZSO	Device Open
ZSC	Device Closed
YL	Motor Run
HS	Equipment Start/Stop

Technical brochures, bulletins and data sheets containing:

Fully completed ISA S20 data sheets

Component functional descriptions

Locations or assembly at which component is to be installed

Materials of a component's parts which will be in contact with process fluids or gases

Schematic and wiring diagrams for control circuits shall be submitted in two stages. Initially, schematic control diagrams shall show complete details on the circuit interrelationships of all devices within and outside each Control Panel. Subsequent to acceptance of all schematic control diagrams, by the Engineer, piping and wiring diagrams shall be submitted. The diagrams shall consist of component layout drawings to scale, showing numbered terminals on components together with the unique number of the wire to be connected to each terminal. Piping and wiring diagrams shall show terminal assignments from all primary measurement devices, such as flow meters, and to all final control devices, such as pumps, valves, chemical feeders and local control panels. Wiring diagrams shall include MCC Panel, circuit, and breaker number for each power feed

Assembly and construction drawings for each alarm annunciator, local indicating panel and for other special enclosed assemblies for field installation. These drawings shall include dimensions, identification of all components, surface preparation and finish data, and nameplates. These drawings also shall include enough other details, including prototype photographs, to define exactly the style and overall appearance of the assembly; a finish treatment sample shall be included.

Installation, mounting, and anchoring details for all components and assemblies to be field-mounted, including conduit connection or entry details.

Complete control panel layouts, all drawn to a 1-1/2 inch=1 foot scale showing:

Physical arrangements which define and quantify the physical groupings of annunciators, handstations, recorders, indicators, pilot lights and all other instrumentation devices associated with control panel sections, auxiliary panels, subpanels and racks.

All cutout locations fully dimensioned. All outside panel dimensions shall be shown.

Locations of back-of-panel stiffeners.

Terminal point locations for all panel and back-of-panel piping and wiring connections. Terminations shall be coded with identifiers for wiring and piping connections for all electric, hydraulic and pneumatic terminations.

Nameplate engraving list.

A complete and detailed bill of material list shall be submitted for each field mounted device or assembly as well as cabinet assemblies and subassemblies. Bills of material shall include all items within an enclosure. An incomplete submittal shall be rejected and no further evaluation performed until a complete and detailed bill of material is submitted

1.6 OWNER'S MANUAL

The Owner's Manual shall be submitted in both paper and electronic format. Electronic format shall conform to the Greenbook and Whitebook Submittals section.

Information included in the OWNER'S MANUAL shall comply with the requirements of the Greenbook and Whitebook Submittals section with the following exceptions:

Two copies of the OWNER'S MANUAL shall be submitted after acceptance of all submittals under Paragraph 1.5. One set will be returned to the Contractor with comments.

Final copies of the OWNER'S MANUAL, after revision, shall be submitted to the Engineer 15 days prior to startup.

The following shall be included in the OWNER'S MANUAL in accordance with the Greenbook and Whitebook Submittals section:

Installation, connection, operating, troubleshooting, maintenance, and overhaul instructions from the manufacturer.

Exploded or details views of all instruments, assemblies, and accessory components.

Parts lists and ordering instructions.

Wiring diagrams.

A list of spare parts for 1 year operation recommended by the manufacturers of all analog equipment.

AS-BUILT LOOP DRAWINGS

As-built loop drawings shall be prepared in accordance with the Greenbook and Whitebook Submittals section with the following exceptions and changes:

The Contractor shall keep current an approved set of complete loop diagrams and schematic diagrams which shall include all field and panel wiring, all piping and tubing runs, all routing, all mounting details, all point-to-point diagrams with cable, wire, tube and termination numbers. These drawings shall include all instruments and all instrument elements for the complete instrument loop as provided under Divisions 11, 13, 14, 15, and 16 of this Contract.

One set of original drawings and two copies of each as-built loop drawing under this Section shall be submitted to the Engineer after completion of field checkout but before placing the systems in service for the Owner's use.

Loop drawing shall also be submitted in electronic format (Microstation)

1.7 SERVICES OF MANUFACTURER

Calibration, Testing and Startup: A technical service representative of the manufacturer shall visit the site and perform the following on all flow meters and analyzers.

Inspection, checking and calibrating the equipment.

Startup and field testing for proper operation.

Performing field adjustments to ensure that installation and operation comply with the Specifications.

Instruction of Owner's Personnel: The manufacturer's technical service representative shall instruct the Owner's personnel as indicated in Paragraph 3.4.

1.8 SPECIAL GUARANTEE

The Contractor shall guarantee the WORK of this section for two years following final acceptance of the WORK. In making any warranty repairs, the Contractor shall utilize technical service personnel designated by the manufacturer of the failed device. Repairs shall be completed within 5 days after written notification by the Owner.

1.9 PRODUCT DELIVERY, STORAGE, AND HANDLING

Delivery of Materials: Products delivered to the site for incorporation into the WORK of this Section shall be delivered in original, unbroken packages, containers, or bundles bearing the name of the manufacturer.

Storage: Products shall be carefully stored in a manner that will prevent damage and in an area that is protected from the elements.

1.10 ENVIRONMENTAL CONDITIONS

General: All instrumentation and control system components and associated wiring shall be suitable for use in a treatment facility environment where there may be high energy AC fields, DC control pulses, and varying ground potentials between transducers and system components. The system design shall be adequate to provide proper protection against interferences from all such possible situations.

Field Situated Equipment: The instrumentation and control system shall be installed on a wastewater treatment plant site. All devices shall be designed to exist in environments rated (G2)(G3)(GX) per ISA S71.04. The system design shall be adequate to provide proper protection the environment typically associated with these facilities. As a minimum, the instrumentation and control systems shall be designed and constructed for satisfactory operation and low maintenance requirements under the following environmental conditions:

Temperature Range: 0 through 50 degrees C (32 through 122 degrees F)

Thermal Shock: 0.55 degrees C per minute (1.0 degrees F per minute)

Relative Humidity: 20 through 95 percent (non-condensing)

Control Room Situated Equipment: Control rooms shall be air conditioned to achieve the environmental noted in item B herein. (No positive control of relative humidity is provided.) In the event of a failure of the air conditioning system, all components of the instrumentation and control system shall be rated to operate in an environment where the ambient temperature is 15 through 35 degrees C (59 through 95 degrees F) and the relative humidity is 20 to 95 percent (non-condensing).

Noise Tolerance: The instrumentation and control system components shall not exceed a db level of 55 when monitored 3-feet away from the devices. If upon testing it is found that this limit is exceeded at the option of the Engineer and at no additional cost to the Owner, devices shall be replaced in order to achieve a maximum level of 55 db or sound absorption materials shall be added.

1.11 CABLE NUMBERING

The first two characters denote the facility or area number.

The second group of characters identifies the device being served (field device, not DCS I/O tag). For instrumentation and controls, this will be the ISA tag number. Other devices should conform to the nomenclature used in the related contract documents (i.e. mechanical or electrical equipment number).

The third section uses one of the four suffixes in the table below. Where multiple circuits of the same type are routed to the same endpoint, the suffix will be P1, P2, as required.

At each device or termination point, the circuit identification number is appended with the individual wire number. For Direct-Current (DC) circuits only, wire polarity is shown in parentheses as (+) or (-).

Spaces are not allowed, and letters are not case-sensitive, and written in upper case.

SUFFIX	CIRCUIT TYPE	EXAMPLE
(A)	24 v dc analog (4-20 mA)	01FIT022(A)-1(+)
(C)	120 volt AC control	05P320(C)-2
(D)	24v dc digital status or control	55LSH201(D)-1(+)
(P)	Power (120 volt, 480 v, 5 kv, 15 kv, etc.)	01MCC6101(P)-2

PART 2 - PRODUCTS

2.1 GENERAL

All meters, all instruments, and all other components shall be of the most recent field-proven models marketed by their manufacturers at the time of submittal of the shop drawings unless otherwise indicated.

Panel mounted instruments shall have matching style and general appearance. Instruments performing similar functions shall be of the same type, model, or class, and shall be of one manufacturer.

Outdoor instrumentation shall be suitable for operation in the ambient conditions at the equipment installation locations. Heating, cooling, and dehumidifying devices shall be incorporated with the outdoor instrumentation in order to maintain it within its rated environmental operating ranges. The Contractor shall provide all power wiring for these devices. Outdoor enclosures suitable for the environment shall be provided.

All instrumentation in hazardous areas shall be intrinsically safe or be approved for use in the particular hazardous classification in which it is to be installed.

Mercury switches and components containing liquid mercury shall not be used.

Analog measurements and control signals shall be electrical and shall vary in direct linear proportion to the measured variable, except as indicated. Electrical signals outside control board(s) shall be 4 to 20 milliampere DC except as noted. Signals within enclosures shall be 1-5 volts DC unless otherwise specified. Dropping resistors

shall be installed at all field side terminations in the control panels to ensure loop integrity.

The accuracy of each instrumentation system or loop shall be expressed as a probable maximum error; this shall be the square-root of the sum of the squares of certified "accuracies" of the designated components in each system, expressed as a percentage of the actual span or value of the measured variable. Each individual instrument shall have a minimum accuracy of ± 0.5 percent of full scale and a minimum repeatability of ± 0.25 percent of full scale unless otherwise indicated. Instruments which do not conform to or improve upon these criteria are not acceptable.

Control panels shall be provided with redundant power supplies which are configured in a fault-tolerant manner to prevent interruption of service upon failure and interruption of service necessitated by the replacement of a power supply. All power supplies shall have an excess rated capacity of 40 percent. The failure of a power supply shall be annunciated locally and shall generate an alarm to the DCS.

Each control loop shall be individually fused.

2.2 CONTROL PANELS

General: Control panels, including those furnished by equipment manufacturers, and shall be provided according to the following requirements.

Where indicated, control panels shall be provided with all required taps, fittings, rotameters, regulation and alarm interlocks to enable the implementation of a purge system which is in conformance with ISA-S12.4 Type Z requirements. Dimensions shall be in accordance with manufacturer's requirements. Elevations and horizontal spacing shall be subject to Engineer's approval.

All control panels which require NEMA 3 or 4 ratings will be provided with window kits to preserve the panel's integrity and enable operations ready access to information.

Panels shall be fabricated, piped and wired by fully qualified workmen who are properly trained, experienced and supervised.

See the Electrical section and drawings for control panels to be provided under this Contract.

Materials:

Panel section faces shall be #10 gage minimum thickness steel for free standing panels and #14 gage minimum thickness steel for smaller panels. All materials shall be selected for levelness and smoothness.

Relay rack high density type panels shall utilize standard relay racks with 14 gage steel frame and supports.

Structural Shapes and Strap Steel: ASTM A 283.

Bolting Material: Commercial quality carbon steel bolts, nuts and washers, all ½-inch diameter with UNC threads. Carriage bolts shall be used for attaching end plates. All other bolts shall be hex head machine bolts. All nuts shall be hot pressed hex, American Standard, heavy. Standard wrought washers shall be used for foundation bolts and attachments to building structures. All other bolted joints shall have S.A.E. standard lock washers.

Fabrication:

End plates, top plates and top closure panels shall be furnished when required. End plates, top plates and top closure panels shall be removable with countersunk bolts to match panels. Top closure panels shall be furnished in lengths which match the widths of standard panels, except that one top closure panel may extend across two 4-foot 6-inches wide or five 2-foot 0-inches wide standard panels. The vertical joints of these panels shall align with the vertical joints of the standard panels.

End closure or rear closure doors shall be provided. Such doors shall be flush fitting and gasketed and be of the hinged lift-off type with lockable door handles. A common key shall be provided for all doors on one panel assembly. Where removable access panels are indicated, they shall be furnished with dished handle fasteners. Screw driver 1/4 turn type fasteners are not acceptable.

The flanged edges of all panels shall be straight and smooth. Corners shall be welded and ground smooth.

The face of the panel shall be true and level after flanging.

All panel cut-outs and holes may be cut or drilled by any standard method that will not cause deformation. Burrs shall be ground smooth.

Adjacent panels shall be assembled with faces flush. Gaps or cracks shall not be visible from the front of the assembled instrument board.

Stiffeners shall be welded to the back of panels, as required to prevent panel deformation due to the weight of front of panel mounted instruments.

Panels shall be self-supporting as defined below.

Framework and Supports:

The rear of each panel section shall have a steel framework for supporting conduit, tubing, wireways, switches, air piping and all instrument accessory items such as relay or terminal enclosures, transducers, pressure switches, valves and air relays. The main frame work shall be constructed of standard structural shapes. Special shapes such as "Unistrut" may be used for secondary supports. Framework must not interfere with instrument connections or access needed for maintenance or adjustments.

Steel framework shall extend 2-feet 8-inches back of the panel face unless otherwise required. Where indicated, individual adjustable leg supports shall be provided at the back of the framework so that the entire panel shall be self-supporting.

Finish:

Preparation: The front and rear face of the panel, both sides and the edges of all flanges, and the periphery of all openings shall be prepared as follows.

All high spots, burrs, and rough spots shall be ground smooth.

The surfaces shall be sanded or sandblasted to a smooth, clean bright finish.

All traces of oil shall be removed with a solvent.

Finishing:

A 3-mils dry coat of Amercoat 185 or equal primer shall be applied over the entire panel surface immediately after solvent cleaning.

Wet sand, dry, then quick glaze spot putty on the front of the panel only. Dry, then wet sand again and dry.

Apply a second 3-mils dry coat of alkyd enamel primer to the front of the panel.

Wet sand to smooth clear finish, then dry.

At least two 3-mil dry coats of air-dry, satin finish, alkyd enamel shall be applied over the entire surface. Color to be as selected by Engineer.

The Contractor shall furnish two 1-pint containers of the enamel to the Engineer.

Instrument Finishing:

The final coats applied to painted surface of instrument cases, doors, or bezels which are visible from the front of panels shall be manufacturer's standard unless otherwise indicated. Black japan or "crinkle" finishes on instrument cases are not acceptable

Mounting of Instruments:

The Contractor shall provide cut-outs, and shall mount all instrument items indicated to be panel mounted, including any instruments indicated to be furnished by other manufacturers.

The Contractor shall also mount, behind the panels, other instrument accessory items as indicated.

Rear of panel mounted equipment shall be installed with due regard to commissioning adjustments, servicing requirements and cover removal.

Wiring shall be kept clear of spare space to give maximum space for future additions.

Piping Requirements for Control Panels:

General:

The Contractor shall provide terminal connections near the top, rear of the panel for all tubing and piping which connect to instruments, valves, air supply and other pressure leads external to the panel. Terminal connections for tubing shall be bulkhead tube unions. Those for pipe shall be threaded couplings, plugged for shipping purposes.

Each terminal connection shall have an engraved metal or plastic plate with a terminal and instrument tag number affixed nearby.

The Contractor shall provide the air supply pressure reducing station, all instrument and supply piping and all pneumatic tubing or piping to terminal connections and between instruments located within the confines of the panel and supporting framework.

Air Supply Piping:

The Contractor shall provide air supply piping from a point near the top of the panel framework to the inlet side of the pressure reducing station, or alternately to the inlet side of individual filter regulators.

Piping, fittings and valves downstream of the filters at the air supply reducing station shall be brass or copper. Headers may be extruded aluminum if the tube wall section is thick enough to accept threaded connections.

The low pressure instrument air supply header shall extend from the down stream side of the main pressure reducing valves across the length of panel which includes air users. Where the header must be broken for shipping purposes, brass unions shall be provided at the panel section junctions.

A separate air supply take-off consisting of a 1/4-inch brass connection braced into the air header (if brass or copper) shall be furnished for each instrument requiring an air supply. An additional 10 percent of the take-offs shall also be provided. Take-offs for 3/4-inch size headers may be made by using 3/4-inch by 3/4-inch by 1/4-inch reducing tees.

Each take-off shall be fitted with a 1/4-inch brass diaphragm of needle type shut-off valve. Provide circular type handle with tag number shown thereon.

The dead end of the air header opposite the supply end shall be fitted with a plugged 1/2-inch brass gate valve.

The connection from the shut-off valves air head to the instruments shall be by means of 1/4-inch or 3/8-inch O.D. tubing as required

Electrical Requirements for Control Panels:

The Contractor shall provide all wiring, conduit, wireways, and switches required to make instruments and other panel electrical devices operational.

Conduit, wireways, junction boxes and fittings shall be installed for all signal wire, all thermocouple and resistance thermometer lead wire including those between temperature sensors and temperature indicators.

Each terminal connection shall have a plastic plate with a terminal and instrument tag number. All wiring shall be identified with stamped tubular wire markers.

Freestanding panels shall be provided with switched 100-watt incandescent back-of-panel lights which are powered from a source independent from that which powers the panel devices. One light shall be provided for every 4 feet of panel width and shall be mounted inside in the top of the back-of-panel area.

Freestanding panels shall be provided with a 15-amp, 120 volt service outlet circuit within the back-of-panel area which are powered from a source independent from that which powers the panel devices. The circuit shall be provided with one 3-wire, 120-volt, 15-ampere, duplex receptacle for every 4 feet of panel width spaced evenly along the back-of-panel area. As a minimum, 2 duplex outlets shall be provided for each panel.

Smaller panels shall be sized to adequately dissipate heat generated by equipment mounted in or on the panel.

Where smaller panels are mounted outside or in unshaded areas, they shall be provided with thermostatically controlled heaters capable of maintaining inside temperatures above 40 degrees F.

Smaller panels shall be provided with a hand-switch controlled 100-watt incandescent light and a breaker protected 120-volt, 15-amp duplex receptacle.

Wiring Methods: Wiring methods and materials for all panels shall be in accordance with the NEC requirements for General Purpose unless otherwise indicated. Opening wiring in close cabinet type panels is allowed when indicated.

Construction:

Wire for 115-volt circuits shall be No. 14 AWG stranded with Type THWN or THHN insulation. All terminals for external wiring connections shall be suitable for No. 12 AWG wire.

Flexible conduit is not acceptable.

Conduit fittings shall be cast fittings.

Soldered or pressure crimped wire splicing in conduits shall be acceptable.

For case grounding, panels shall be provided with a 1/4-inch by 1-inch copper ground buss completed with solderless connector for one No. 4 AWG bare stranded copper cable. The Contractor shall connect the copper cable to a system ground loop.

Single case annunciator units with no remote logic which are installed at the top of a panel may be considered as being a terminal box when top of panel wire entry is indicated. If bottom of panel entry is indicated, terminal box shall be provided at the bottom of the panel and wired to the annunciator. Terminals shall be identified with plastic marker strips.

Terminal boxes for incoming and outgoing signal leads shall be located at the top or bottom of the panel as indicated or as otherwise required.

Power Supply Wiring:

Unless otherwise indicated, all instruments, all alarm systems, and all motor controls shall operate on 24 VDC circuits.

The Contractor shall furnish terminal box connections for the main power supply entry as indicated.

Power supply switches for alarm units shall be three pole type, arranged to open both the power and alarm circuits. Each annunciator shall be equipped with a separate switch.

Instruments located on a single panel section which serve one process unit may be connected to a common branch power circuit. The number of branch circuits shall be such that no circuit load exceeds 10 amps. Different panel sections and instruments serving different process units shall not use common branch circuits. A 15-amp, two-pole circuit breaker shall be provided in each branch circuit. When instruments do not come equipped with integral fuses, the panel fabricator shall furnish and install fuses as required for the protection of individual instrument against fault currents. Fuses shall be mounted on the back of the panel, in a fuseholder, with each fuse identified by a service name tag.

Each potentiometer type instrument, electronic transducer, controller or analyzer shall have an individual disconnect switch. Disconnect switches shall have metal or plastic tags listing the associated instrument tag numbers. Individual plug and cord set power supply connections may be used without switches when indicated.

Where alarm units are single unit types, one switch may be used to disconnect not more than six alarm units located on the same or adjacent panels.

Alarm Wiring: The Contractor shall provide all alarms including light cabinets, audible signal units, test and acknowledge switches and remote logic units as indicated. Interconnecting wiring to panel mounted initiating devices shall also be provided. Wiring from external initiating devices shall be provided by the Contractor. Where plug and cord sets are provided for component interconnection, the Contractor shall harness and support the cables in a neat and orderly fashion. Where separate wire is required, the Contractor shall install 16 AWG with THWN or THHN insulation between all components.

Signal Wiring:

Computer and Non-Computer Use:

Signal wire shall be twisted shielded pair or triads in conduit or troughs. Cable shall be constructed of No. 16 AWG copper signal wires with THWN or THHN insulation. Color code for instrument signal wiring shall be:

Positive - Black (+)

Signal Ground Negative - White (-)

Equipment Ground - Green

Ungrounded - Red

Energized by voltage sound external to panel - Yellow

DC circuit - Blue

Multiconductor cables where indicated shall consist of No. 16 AWG copper signal wires twisted in pairs, with 600 volt fault insulation. A copper drain wire shall be provided for the bundle with a wrap of aluminum polyester shield. The overall bundle jacket shall be PVC.

Multi-conductor cables, wireways and conduit shall provide for 10 percent allocation of spare, unused signal wires in addition to the indicated requirements.

Thermocouple Wiring:

The Contractor shall provide metal wire troughs, pullboxes, and thin walled conduit for duplex thermocouple lead wire in a manner which will facilitate field installation of lead wire without splices or terminal connections. The Contractor shall also provide the lead wire connections between multipoint temperature sensors and temperature indicators when indicated. When a thermocouple junction box is indicated, it shall be located with the approval of the Engineer. The panel manufacturer shall install conduit and troughs and lead wires between the junction box and the instruments. Terminal material shall be compatible with extension wire used.

Thermocouple lead wire shall be No. 16 AWG with high temperature PVC insulation on each wire and PVC jacket overall, and shall conform to the latest ISA Specification for standard grade.

Conduit for thermocouple lead wire shall be in accordance with the following:

CONDUIT SIZE	½"	¾"	1"	1½"	2"
NO. OF DUPLEX LEADS	1	4	6	16	26

Where the number of duplex lead wires exceeds 26, the wires shall be installed in rectangular ducts filled to not more than 40 percent capacity.

All thermocouple wireways and main conduits shall be sized to allow for 10% spare thermocouple leads.

Each signal, control, alarm, and indicating circuit conductor shall be designated by a single unique number which shall be shown on shop drawings. These numbers shall be marked on all conductors at every terminal using white numbered wire markers which shall be plastic-coated cloth, or shall be permanently marked heat-shrink plastic.

Terminal Blocks: Terminal blocks shall be molded plastic with barriers and box lug terminals, and shall be rated 15 amperes at 600-volts. White marking strips, fastened securely to the molded sections, shall be provided and wire numbers or circuit identifications shall be marked thereon with permanent marking fluid.

Color Conventions: Lens covers for indicating lights on all panels will be colored as follows:

Red-ON when;

- Motor not running (STOPPED)
- Valve CLOSED (not fully opened)
- Device not energized.
- Circuit breaker OPENED

Green-ON when;

- Motor running in forward direction (fast speed for multi-speed motors).
 - Valve OPEN (not fully closed)
 - Device energized.
 - Circuit breaker CLOSED

White-ON when;

- Power available

- System in AUTOMATIC mode.
- Monitoring taking place.

Amber-ON when;

- Malfunction trip.
- Equipment locked out.
- Alarm condition

Nameplates: Nameplates shall be provided for instruments, function titles for each group of instruments, and other components mounted on the front panel(s) as indicated. A nameplate shall be provided for each signal transducer, signal converter, signal isolator, and electronic trip mounted inside the panel(s). Nameplates shall be descriptive to define the function and system of such element. These nameplates shall be of the same material as those on the front of the panel(s). Adhesives shall be used for attaching nameplates. Nameplates shall be fabricated from black face white-center laminated engraving plastic. Painted surfaces shall be prepared to allow permanent bonding of adhesives. Colors, lettering, styles, abbreviations and sizes shall be in conformance with ISA-RP60.6 with an intended viewing distance of 3 feet to 6 feet.

Factory Inspection:

Panels shall be inspected for compliance with requirements at the factory before shipment to the site. The Contractor shall notify the Engineer 2 weeks in advance of the testing date. A representative of the Engineer will visit the factory to make the inspection.

Contractor shall perform the following tests prior to arrival of the Engineer:

All air lines adequately tested for leaks.

All alarm circuits rung out to determine their operability.

Electrical circuits checked for continuity and where applicable, operability.

Nameplates checked for correct spelling and correct size of letters.

Other test required to place the panel in an operating condition.

It shall be the responsibility of the Contractor to furnish all necessary testing devices and sufficient manpower to perform the tests required by the Engineer to determine conformance to the requirement of the Contract documents.

If the above tests have not been performed prior to the arrival of the Engineer, the Contractor shall reimburse the Owner for the cost of the extra time required for the inspector's services and travel expenses

Shipment:

Panels shall be crated for shipment using a heavy framework and skids. Panel sections shall be cushioned to protect the finish of the instruments and panel during shipment. Instruments which are shipped with the panel shall have suitable shipping stops and cushioning material installed to protect instrument parts from mechanical shock damage during shipment. Each panel crate shall be provided with removable lifting lugs to facilitate handling

2.3 GENERAL INSTRUMENTATION ENCLOSURE COMPONENTS

Signal Isolators, Converters, and Power Supplies: Signal isolators shall be provided in each measurement and control loop, wherever required, to match adjacent component impedances, or where feedback paths may be generated or to maintain loop integrity when the removal of a component of a loop is required. Signal converters shall be provided where required to resolve any signal incompatibilities. Signal power supplies shall be provided to supply sufficient power to each loop component.

General Purpose Relays: General purpose relays in the Control Panels shall be plug-in type with contacts rated 10 amperes at 120 volts ac; quantity and type of contacts shall be as indicated. Each relay shall be enclosed in a clear plastic heat and shock resistant dust cover. Sockets for relays shall have screw type terminals.

Time Delay Relays: Time delay relays shall be electronic on-delay or off-delay type with contacts rated [10],[]-amperes at 120-volts AC. Units shall include adjustable dials with graduated scales covering the indicated time range.

Slave Relays: Slave relays shall be provided when the number or type of contacts indicated exceed the contact capacity of the indicated relays and timers.

Circuit Breakers: Circuit breakers shall be single pole, 120-volt, 15 ampere rating or as required to protect wiring and equipment. Circuit breakers shall be mounted inside the panels as shown.

2.4 FLOW MEASURING SYSTEMS

Magnetic Flow Measuring Systems: Magnetic flowmeter systems shall be of the low frequency electromagnetic induction type and produce a 4 - 20 mA DC signal directly proportional to and linear with the liquid flowrate. 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.

The metering tube shall have the following attributes:

constructed of 304 or 316 stainless steel with flanged connections

utilize a minimum of 2 bullet-nosed, self-cleaning electrodes

liner in conformance with the manufacturer's recommendation for the meters intended service

electrodes constructed of materials which are in conformance with the manufacturer's recommendation for the meters intended service

meter housing rated for NEMA 6 submergence conditions

meter coating consisting of epoxy painted finish

two grounding rings which are in conformance with the manufacturer's bore and material recommendation for the meters intended service. Grounding rings shall be designed to protect and shield from process abrasion the liners edge interface at the meters end:

The microprocessor-based signal converter/transmitter shall have the following attributes:

utilize DC pulse technique to drive flux-producing coils

convert DC pulse signal from the tube to a standardized 4-20 mA signal into a minimum of 700 ohms

6 digit LCD display for flow rate, percent of span, and totalizer

an operator interface consisting of keypads which respond to English text entry

integral zero return to provide a consistent zero output signal in response to an external dry contact closure

integral low flow cutoff and zero return

automatic range change

capable of measuring flow in both directions

programmable parameters including meter size, full scale Q, magnetic field frequency, primarily constant, time constant

data retention for a minimum of 5 years without auxiliary power (main or battery)

self diagnostics and automatic data checking

protected terminals and fuses in a separate compartment which isolates field connection from electronics

utilize "Smart" technology which employs a hand-held configuration terminal and outputs a digital flow signal superimposed on 4-20 mA signal and complies to protocol which is ungradable to SP 50.

produces a scalable frequency output, 0 to 100 Hz, transistor switch closure up to 5.75 W externally powered, 5, to 24 VDC

can tolerate ambient temperature operating limits of -20 to 140 degrees F (-29 to 60 degrees C)

Each flow metering system shall be hydraulically calibrated at a facility which is traceable to the National Institute of Standards and Technology. The calibrations procedure shall conform to the requirements of MIL-STD-45662A. 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 Engineer at least thirty (30) days prior to shipment of the meters to the project site. The flow metering system shall conform to the following technical specifications: Time constant = 0.5 to 1000 seconds; galvanic or optic isolation: Accuracy: 0.25% of flow rate from 10 to 100% full scale for velocities over 3 FPS: Repeatability: 0.25% full Scale: Power consumption: 30 watts or less: Power Requirements: 120 VAC, \pm 10% (24 VDC).

Magmeters shall be Krohne America to match existing.

2.5 LEVEL DETECTION SWITCHES

Side-Mounted Float level Switches: Liquid level switches shall be the side mounted float actuated type. Float switches shall be SPDT and shall consist of a fixed sealed reed switch actuated by a floating magnet. Level switches shall be flange or plug mounted to suit field requirements. Process wetted materials shall be plastic and/or 316 stainless steel.

PRESSURE MEASURING SYSTEMS

Electronic Pressure Transmitters: Electronic pressure transmitters shall be two wire devices with continuously adjustable span, zero and damping adjustments, integral indicators scaled in engineering units, solid state circuitry and 4-10 mA outputs. Accuracy shall be plus or minus 0.25 percent of calibrated span. Process wetted and body materials shall be 316 SS. Process connections shall be 1/2-inch NPT. Electronic pressure transmitters shall be SMAR to match existing. Electronic pressure transmitters shall be SMAR to match existing.

See the Electrical section and drawings for a schedule of required devices for this Contract.

Local Pressure Measuring Systems: Pressure gauges shall be installed on suction and discharge connections to pumps; on discharge connections from blowers and compressors; at each side of pressure reducing valves; and where otherwise indicated.

Vacuum gauges and compound gauges, where indicated, shall be installed on vacuum pumps. Gauges shall have Type 316 stainless steel movement and stainless steel or alloy case. Except as otherwise indicated, gauges shall have a 3-1/2-inch dial, 1/4-inch threaded connection, a Type 316 stainless steel snubber adapter, and a shut-off valve. Gauges shall be calibrated to read with an accuracy of ± 1 percent to 150 percent of the indicated pressure. Gauges shall be vibration and shock resistant. Gauges on liquid service should have cases filled with a suitable liquid. Gauges attached to systems containing chemical solutions, corrosive fluids, sludge, sewage, or other liquids containing solids, shall be equipped with diaphragm seals, or equal protective pressure or vacuum sensing devices, and comply with the following:

- | | |
|--|---|
| 1.For: sewage, sludge, liquids containing solids, pulsating flow | Seals shall be fabricated with Type 316 stainless steel, with stainless steel diaphragm for pressures over 15 psi, and elastomer diaphragm for pressures of 15 psi and below with Type 316 stainless steel nuts and bolts, fill connection and valved flush port size 1/4-inch N.T.P., capable of disassembly without loss of filler fluid. |
| 2.For: chlorine and sulfur dioxide under pressure | Seals shall be fabricated with carbon steel with silver diaphragm and shall be rated at 800 psi. |
| 3.For: chemical solutions, low pressure sewage and chemical sludge except as otherwise indicated | Seals shall be fabricated with PVC body for removable mounting and rated at 200 psi, with Type 316 stainless steel bolts and nuts, 1/2-inch inlet, 1/4-inch outlet, liquid-filled with Teflon diaphragm for pressure service and proper elastomer diaphragm for vacuum service. |

Diaphragm Seals for Pressure Measuring Systems: Diaphragm seals shall consist of bottom housing, lower ring, diaphragm capsule, fill screw, flushing connection, and a top housing. The diaphragm seal shall attach to the inlet connection of a pressure instrument to isolate its measuring element from the process fluid. The space between the diaphragm and the instruments pressure element shall be solidly filled with a suitable liquid. Displacement of the liquid fill in the pressure element through the movement of the diaphragm shall transmit process pressure changes directly to a gauge, transmitter, switch or any other pressure instrument. The diaphragm seal shall have a removable bottom housing to permit the servicing of the need to refill. All exposed surfaces, housings, and diaphragm shall be constructed of 316 stainless steel.

CONTROL PANEL INSTRUMENTATION

Digital Indicators:

Digital indicators shall be self-contained instruments that display process signals directly in engineering units. The unit shall be suitable for panel mounting and shall utilize an LED display where numerals are no less than [0.5-inch] height.

The input signal to the digital process indicator shall be 4-20 mA DC or 1-5 VDC. The input sample rate of the unit shall be a minimum of 2 per second. The unit shall have an auto-zeroing feature and shall have provisions for field adjustable scaling and offset. Accuracy shall be plus or minus 1 least significant digit. Input power to the digital indicator shall be 120 VAC, 60 Hz.

Selector and Pushbutton Switches: Selector and pushbutton switches shall be rated 10 A at 600 volts, shall be heavy-duty, oil-tight, and shall have the number of positions and poles indicated. Operators shall be corrosion resistant.

Indicating Lights: Indication lights shall be incandescent push-to-test type and shall be heavy-duty, oil-tight. Each light shall have a screwed-on glass prismatic lens approximately 1-inch in diameter. Each light shall have a factory-engraved legend plate as indicated. Indicating lights shall be 120 VAC type with transformers for use with 6.3 volt lamps.

PART 3 - EXECUTION

INSTALLATION

The Contractor shall employ installers who are skilled and experienced in the installation and connection of all elements, all instruments, all accessories, and all assemblies provided under this Contract.

The Contractor shall install all instruments according to the manufacturer's installation instructions and the following:

Perform field engineering as required for mounting and supporting all field mounted components.

Prepare any additional schematic and interconnection diagrams required for installation.

Assemble and interconnect instrument components disconnected for shipping purposes.

Remove all temporary supports, bracing, and padding inserted in instrument control panels and other equipment to prevent damage during shipping, storage, or installation.

All piping shall be field measured prior to fabrication and erection. Any significant discrepancies between drawings and field conditions shall be reported to the Engineer. The Owner will not be responsible for any costs to the Contractor for rework because of Contractor failure to take measurements prior to fabrication.

Adequately support and protect capillary tubing. All extra tubing shall be carefully coiled, tied, and protected at the instrument location.

The Contractor shall install pneumatic instrument air systems according to the manufacturer's installation instructions and the following:

Install all pneumatic tubing and make all connections at control panels, instruments, and control valves.

Perform field engineering as required for instrument air supply headers and individual air supply taps and lines.

Check all air supply branch headers by blowing with clean air and checking for tightness.

Clean all transmission and control tubing by blowing with dried and filtered air prior to connecting to instrument components.

Leak test all pneumatic control circuits in accordance with ISA Recommended Practice RP-7.1.

Set all instrument air regulators at manufacturer's recommended supply pressures.

It is the intent of the Contract Documents that all wiring external to Control Panels be provided under the requirements of Division 16. Further, it is the general intent that all 4-20 mA signal circuits, process equipment control wiring, signal wiring to field instruments, and Control Panel input and output wiring, be provided under Division 16 and be terminated and identified under Division 13.

The Contractor's attention is directed to the electrical and mechanical schematics and details of this project. Referral to these portions of the Contract Documents shall be required in order to understand the full intent and scope of work required.

Monitoring and control system configurations are diagrammatic only. Locations of equipment are approximate unless dimensioned on the drawings. Exact locations and routing of wiring and cables shall be governed by structural conditions, physical interferences, and locations of electrical terminations on equipment.

Where job conditions require minor changes in approximated locations and arrangements, the Contractor shall make such changes without additional cost to the Owner.

All instruments shall be located and installed for ready access by the Owner's operation and maintenance staff. The Owner reserves the right to require minor changes in location of equipment prior to roughing without any additional cost to the Owner.

Meters shall be installed in easily accessible locations and orientated for ease of reading and maintenance, and where shown, for balancing flow. Wherever possible,

meters shall be inserted in such a way to comply with the manufacturer's recommendations. Meters, shut-off and balancing valves shall be properly supported. In-line meters shall be installed to ensure full-line flow and not less than the manufacturer's recommended head at all times.

3.2 CONTROL PANEL SIGNAL AND CONTROL CIRCUIT WIRING

Wiring Installation: All wires shall be in plastic wireways except (1) field wiring, (2) wiring between mating blocks in adjacent sections, (3) wiring from components on a swing-out panel to components on the fixed structure, and (4) wiring to panel-mounted components. Wiring from components on a swing-out panel to other components on fixed panels shall be tied into bundles with nylon wire ties, and shall be secured to panels at both sides of the "hinge loop" so that conductors are not strained at the terminals.

Wiring to control devices on the front panels shall be tied together at short intervals with nylon wire ties and secured to the inside face of the panel using adhesive mounts.

Wiring to rear terminals on panel-mount instruments shall be in plastic wireways secured to horizontal brackets above or below the instruments in about the same plane as the rear of the instruments.

Wire Marking: Each signal, control, alarm, and indicating circuit conductor connected to a given electrical point shall be designated by a single unique number which shall be shown on all shop drawings. These numbers shall be marked on all conductors at every terminal using white numbered wire markers which shall be permanently marked heat-shrink plastic.

INSTRUMENT CABLE TESTS

General: The following tests shall be performed on each instrumentation and control system cable. All tests shall be end-to-end tests of installed cables with the ends supported in free air, not adjacent to any grounded object. All test data shall be recorded on forms which are available from the Engineer. Complete records of all tests shall be made and delivered to the Engineer. Each form shall be signed by the [Engineer or the Engineer's Representative] who witnessed the testing.

Continuity tests shall be performed by measuring wire/shield loop resistance of each signal cable as the wires, taken one at a time, are shorted to the channel shield. No loop resistance measurement shall vary by more than plus or minus 2 ohms from the calculated average loop resistance value.

Insulation resistance tests shall be performed by using a 500 volt megohmmeter to measure the insulation resistance between each channel wire, between each channel wire and the channel shield, between individual channel shields in a multichannel cable, between each individual channel shield and the overall cable shield in a multi channel cable, between each wire and ground, and between each shield and ground. Values of resistance less than 1 megohms shall be unacceptable.

INSTALLATION, CALIBRATION, TESTING, PRECOMMISSIONING, STARTUP AND INSTRUCTION

Installation and Connection: The Contractor shall install and connect all field-mounted components and assemblies under the following criteria:

Process sensing lines and air signal tubing shall be installed to the installation of conduit indicated under Section 16050. Individual tubes shall be run parallel and near the surfaces from which they are supported. Supports shall be used at intervals not longer than 3 feet of tubing.

Bends shall be formed with the proper tool and to uniform radii and shall be made without deforming or thinning the walls of the tubing. Plastic clips shall be used to hold individual plastic tubes parallel. Ends of tubing shall be square-cut and cleaned before insertion into fittings. Bulkhead fittings shall be provided at all panels requiring pipe or tubing entries.

All flexible cables and all capillary tubing shall be provided in flexible conduits. Lengths shall be sufficient to withdraw the cables and tubing for periodic maintenance.

Thermocouple lead wire shall be provided in dedicated conduit or wireway from the thermocouple to the control panel. Conduit or wireway shall be sized in accordance with the capacity of the instrument.

All power and all signal wires shall be terminated with spade type lugs.

All connectors shall be, as a minimum, water tight.

After all installation and connections have been completed, a technical field representative of the Contractor shall check the WORK for polarity of electric power and signal connections, leaks at all process connections, and conformance with requirements. The technical field representative shall certify in writing to the Contractor that each loop and system meets requirements.

All wire and all cable shall be connected from terminal to terminal without splices, arranged in a neat manner and securely supported in cable groups. All wiring shall be protected from sharp edges and corners.

Calibration: All analog instrumentation and all control system equipment shall be calibrated and tested after installation to verify that requirements are satisfied. The Contractor shall provide all necessary labor, tools, and equipment to calibrate and test each instrument in accordance with the manufacturer's instructions. Each instrument shall be calibrated at a minimum of three points using test equipment to simulate inputs and read outputs. All test equipment and all instruments used to simulate inputs and read outputs shall be suitable for the purpose intended and shall have an accuracy better than the required accuracy of the instrument being calibrated. Test equipment shall have accuracies traceable to the NIST as applicable. All analog instruments shall

be calibrated and tested in place without removal. Test data, applicable accuracy requirements, all instrument manufacturer published performance specifications and all permissible tolerances at each point of calibration shall be entered on test forms available from the Engineer. These test forms shall verify compliance with all. A report shall be delivered to the ENGINEER for each instrument, certifying that the instrument has been calibrated in the presence of the [Engineer or the Engineer's designated representative] and meets contract and system requirements.

Analog Loop Tests: The Contractor shall be responsible for loop checking and testing all instrumentation loops with this project. The Contractor shall coordinate all loop check functions with the CSP to ensure that a single total loop check is conducted. The intent of the loop checks is to confirm and document each loop's component specification conformance up to and including all field-situated CSP devices. The CSP will have all control room personnel present to witness and confirm loop check results at the CRT level. The Contractor shall provide all necessary labor, tools, and equipment to field test, inspect and adjust each instrument to its indicated performance requirement in accordance with manufacturer's specifications and instructions. Any instrument which fails to meet any Contract requirement, or any published manufacturer performance specification for functional and operational parameters, whether or not indicated in the Contract Documents, shall be repaired or replaced, at the discretion of the Engineer at no additional cost to the Owner.

At least 15 days before installation testing begins, the Contractor shall submit to the Engineer a detailed description, in duplicate, of the installation tests to be conducted to demonstrate correct installation of the instrumentation and control system and the anticipated dates the testing will occur.

Controllers and electronic function modules, shall be tested and exercised by the Contractor to demonstrate correct operation, first individually and then collectively as functional analog networks. Each hardwired analog control network shall be tested to verify proper performance within indicated accuracy tolerances. Accuracy tolerances for each analog network are defined as the root-mean-square-summation of individual component accuracy tolerances. Individual component accuracy tolerances shall be as indicated by contract requirements, or by published manufacturer accuracy specifications, whenever contract accuracy tolerances are not indicated.

Each analog network shall be tested by applying simulated inputs to the first element(s). Simulated sensor inputs corresponding to 10 percent, 50 percent, and 90 percent of span shall be applied, and the resulting outputs read to verify compliance to network accuracy tolerance requirements. Continuously variable analog inputs shall be applied to verify the proper operation of discrete devices. Temporary settings shall be made on controllers, alarms, etc., during analog loop tests. All analog loop test data shall be recorded on test forms, which include calculated root-mean-square-summation system accuracy tolerance requirements for each output.

Air systems shall be tested for leaks in compliance with ISA RP7.1.

When installation tests have been successfully completed for all individual instruments and all separate analog control networks, a certified copy of all test forms signed by the [Engineer or the Engineer's representative] as a witness, with test data entered, shall be submitted together with a clear and unequivocal statement that all instrumentation has been success fully calibrated, fully inspected, and fully tested.

System Pre-commissioning: The Contractor shall responsible for demonstrating the operability of all systems provided under this specification. The City will assist and coordinate the operability assessment with the Contractor. Pre-commissioning shall commence after acceptance of all wire, all calibrating and loop tests, and all inspections have been conducted. Pre-commissioning shall demonstrate proper operation of all systems with process equipment operating over full operating ranges under actual operating conditions.

The Contractor shall develop and submit to the Eengineer for approval a Pre-Commissioning Plan which describes detailed test procedures, checklists, blank forms and data to be recorded, test equipment to be used and calculated tolerance limits.

System pre-commissioning activities shall include the use of water to establish service conditions that simulate, to the greatest extent possible, normal final control element operating conditions in terms of applied process loads, operating ranges and environmental conditions. Final control elements, control panels, and ancillary equipment shall be tested under start-up and steady-state operating conditions to verify that proper and stable control is achieved using motor control center and local field mounted control circuits. All hardwired and software control circuit interlocks and alarms shall be operational. The control of final control elements and ancillary equipment shall be tested using both manual and automatic (where provided) control circuits. The stable steady-state operation of final control elements running under the control of field mounted automatic analog controllers or software based controllers shall be assured by adjusting the controllers, as required, to eliminate oscillatory final control element operation. The transient stability of final control elements operating under the control of field mounted, and software based automatic analog controllers shall be verified by applying control signal disturbances, monitoring the amplitude and decay rate of control parameter oscillations (if any) and making necessary controller adjustments, as required, to eliminate excessive oscillatory amplitudes and decay rates.

All electronic control stations incorporating proportional, integral or differential control circuits shall be optimally tuned, experimentally, by applying control signal disturbances and adjusting the gain, reset or rate setting(s) as required to achieve a proper response. Measured final control element variable position/speed setpoint settings shall be compared to measured final control element position/speed values at 10 percent, 50 percent and 90 percent of span and the results checked against indicated accuracy tolerances. Accuracy tolerances are defined as the root-mean-square summation of individual component accuracy tolerances.

Individual component accuracy tolerances shall be as indicated in the Contract Documents or as specified by published manufacturer accuracy specifications whenever not indicated.

The Contractor shall submit an instrumentation and control system precommissioning completion report which shall state that all Contract requirements have been met and which shall include a listing of all instrumentation and all control system maintenance and repair activities conducted during the pre-commissioning testing. The Engineer must accept the instrumentation and control system pre-commissioning testing before the seven day operational testing may begin. Final acceptance of the control system shall coincide with final acceptance of the WORK.

Operational Testing: The Contractor shall furnish his own personnel, electrical personnel, and any instrument manufacturers representatives as required during the testing period required in the Startup Requirements section to produce a fully operational system.

Instruction: The Contractor shall train the Owner's maintenance personnel in the maintenance, calibration and repair of all instruments provided under this contract.

The training shall be scheduled a minimum of 3 weeks in advance of the first session. The training shall be performed concurrent with the pre-commissioning in subparagraph D.

The training shall be performed by qualified representatives of the instrument manufacturers and shall be specific to each instrument model provided. Instructors shall have at least 2 years of training experience.

Each training class shall be a minimum of 8 hours in duration and shall cover Operational Theory, Maintenance, Trouble Shooting/Repair, and Calibration of the instrument.

Proposed training material, including resumes for the proposed instructors and a detailed outline of each lesson shall be submitted to the Engineer at least 30 days in advance of when the lesson is to be given. The Engineer shall review the submitted data for suitability and provide comments which shall be incorporated into the course.

Within 10 days after the completion of each lesson the Contractor shall present to the Engineer the following:

A list of all Owner personnel that attended the lesson.

An evaluation of Owner personnel knowledge through written testing or equivalent.

A copy of text utilized during the lesson with all notes, diagrams, and comments.

3.5 PROCESS CONTROL STRATEGIES

The control strategies shown in Appendix A at the end of this Section complement the Process and Instrumentation Diagrams (P&IDs). All materials and components shall be furnished, whether explicitly indicated or not, to effect the functional requirements

defined on the P&IDs and in the process control strategy descriptions. The Contractor shall utilize the control strategies as a resource in generating control narratives to be included in the analog hardware submittal.

Common functions that are generally applicable to all strategies or to similar strategies are described within Appendix A. These functions are not repeated in the descriptions for each strategy.

Each strategy is described as follows:

Overview: A brief description of the mission of the related strategy including the roles of logic, monitoring and control stations located/associated with MCCs, field situated equipment, control panels, and the DCS.

Detailed Strategy Functions: A detailed description of each and every monitoring and control function associated with the associated strategy. This description addresses the strategies reaction to sensor failures, process equipment failures, control device failures, DCS malfunctions, and power interruptions. All control modes (MCC, local hand station, local control panel, DCS keyboard) are fully described. These descriptions are augmented by a listing of all instruments, valves, control devices, process equipment, and DCS equipment associated with the noted strategy. All control sequences associated with equipment activation, deactivation, process startup and process shutdown are defined along with all required time delays.

Preface to Control Strategy Section:

Tag numbering system

Definitions and terms

Controls and control functions provided for all equipment, unless otherwise noted

Local control station at equipment

Local/DCS switch

Alarms logic - open contact for alarms (fail-safe)

Format for Each Strategy

a. General Description

- (1) An overall description of the process
- (2) Major control components (PCM, PLC, annunciator, panels)
- (3) General function of each major control component
- (4) P & ID references for this strategy
- (5) Reference to I/O listing

b. Related Equipment:

c. Overview of Strategy

- d. Non-DCS Control
 - (1) Local Manual Control: Description of monitoring and control from each equipment item. If this is covered by the general statement in the Preface, describe any deviations. Example: "Because of inaccessibility location of this valve in the sump, a local control station is not provided."
 - (2) Remote Manual Control: Description of control from any local or area control panels. Other Control: Package system, PLC, etc.
- e. DCS alarm, monitoring and control functions
 - (1) DCS Manual Control
 - (2) DCS Automatic Control
 - (3) Alarms - define alarms and alarm priorities. Define level (1, 2, 3, or 4) for each alarm
- f. Failure Modes
- g. Communications Interfaces
- h. In-Service/Out of Service Algorithm: Description of devices which determine in/out of service status for each piece of equipment. (In-service (I/S)/out of service (OOS) algorithms mask or block out all or selected alarms associated with the OOS device (i.e., if a wetwell is declared OSS, low level alarms shall be inhibited). Additionally, if a device has been designated OOS, all control routines shall declare the equipment as being unavailable for service.

See Appendix A in this Section for detailed descriptions of the process control strategies.

3.6 INSTRUMENT SUMMARY

General: The Instrument Summary (IS) itemizes the instrumentation devices, including control panels, to be furnished under this contract. Specific device requirements for the instrumentation referenced in Part 2 shall be included in the instrument summary such as meter size, ranges, scales, set points, NEMA ratings, flange sizes, pipe connection sizes, material types, probe types, etc.

Each column on the Instrument Summary is defined as follows:

Tag Number: The identifier assigned to a device which performs a function in the control system. The Contractor shall use this identifier in tagging devices in the field.

Loop Number: The number assigned to the control loop associated with the device.

Description: A process-oriented functional description which defines the measured/monitored/controlled parameter and the associated process/process equipment.

P&ID Drawing Number: The Process and Instrumentation drawing upon which the device appears.

Technical Specification Number: The number associated with the technical specification which describes the requirements associated with the device.

Specification Section Number: The specification section under which the device shall be provided.

Control Panel Number: The designation of the control panel where the device resides.

Control Panel Reference Number: The drawing or schedule number associated with the control panel's face-plate representation.

Mechanical Drawing Number: The mechanical drawing upon which the device appears.

Electrical Drawing Number: The electrical drawing upon which the device appears.

Installation Detail Number: The designation of the installation detail defining the installation requirements associated with the device.

DCS INPUT/OUTPUT (I/O) SUMMARY

General: The I/O list itemizes all inputs and outputs to and from the DCS, both hardwired and data linked, which are furnished by the Contractor.

Each column on the I/O List is defined as follows:

Tag Number: The ISA identifier assigned to a device which performs a function in the control system. The Contractor shall use this identifier in tagging devices in the DCS.

Loop Number: The number assigned to the control loop associated with the I/O.

Description: A 30-character process-oriented functional description which defines the measured/monitored/controlled parameter and the associated process/process equipment.

Alarm Priority: A 0-3 designation that determines the severity of the alarm triggered with 3 being the highest (most severe) and 0 the lowest.

Scale: The top value and bottom value of the analog process variable to be displayed or controlled by the DCS.

Set: The status to be displayed on the alarm summary when a digital point is activated.

Reset: The status to be displayed on the alarm summary when a digital point is not activated or returns to its normal state.

P&ID Drawing Number: The Process and Instrumentation drawing upon which the device appears.

I/O Type: The type of I/O required for current and future monitoring and control activities (spare I/O is not included).

Analog Input (AI): If the tag number generates an AI, the quantity of AIs are listed here.

Analog Output (AO): If the tag number generates an AO, the quantity of AOs are listed here.

Discrete Input (DI): If the tag number generates a DI, the quantity of DIs are listed here.

Discrete Output (DO): If the tag number generates a DO, the quantity of DOs are listed here.

Data link No.: The name of the data link the soft I/O point is associated with.

PCM /RIO/PLC Number: The designation of the PCM, RIO, or PLC where the I/O resides.

Fail-safe: (Yes or No) : For digital inputs, whether the field device is to be wired as "open contact on alarm".

Remarks: Any clarifying remarks are made in this area such as pulse inputs, cross references to mechanical and electrical drawings on which the PCM appears.

Totals: A summary row shown at the bottom of the I/O list which indicates the total amount of each type of I/O associated with a PCM. I/O associated with future shall be separately tabulated.

End of Section

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APPENDIX A - CONTROL STRATEGIES

SECTION 13300 - INSTRUMENTATION AND CONTROL

LEGEND

PCM - Process Control Module (Transmits process data to and from the field and provides plant automation)

DCS – Distributed Control System (Plant Computer Control System)

UPS – Uninterruptable Power System (Provides battery back-up power to the PCM)

DH – Data Highway (Plant process network where PCM, workstation, and historian communications take place)

DIN – District Information Network (Fiber Optic Transmission to COMC)

LCP – Local Control Panels

PID – Proportional-Integral-Derivative

PLC – Programmable Logic Controller

GENERAL CONTROL AND MONITORING

These control strategies are not intended to be all-inclusive operational procedures for the operation of the complete facility. In general, control and monitoring functionality is as follows:

1. Alarm monitoring and generation, process sequencing, automatic control of auxiliary systems and equipment interlocking control strategies are resident within the DCS.
2. Fault tolerant PCM(s) communicate with the DH and contain enhanced DCS automatic control algorithms for process sequencing control based on level, pressure, flow, or other conditions.
3. The DCS workstations shall serve as the operation staff's "window" into the process, enabling operations to locally monitor, interrogate, and manipulate plant processes.
4. The DCS shall provide reporting, historian, diagnostic, client access and other file server functions.

5. The DCS provides information to the District Information Network (DIN) via the communication link between DCS and DIN

6. All alarms shall be fail safe and activate upon loss of power.

COMMON DCS/PLC FUNCTIONS

Common functions and terms for basic monitoring and control operations are provided as a standard of implementation for the control system. These terms and functions address items that are typical for process control loops and most operator initiated actions. These functions are not necessarily repeated in each individual control strategy. Unless otherwise stated they are considered a part of each implemented control strategy.

Provision shall be made to include certain control functions that apply to all analog inputs, virtual variables, analog controllers and discrete control whether or not shown on the P&IDs, even though one or more of the functions may be disabled by the user for a given data base point:

1. **Verification of Digital Outputs:** In Semi-Auto and Auto mode each command will be monitored for the desired results before proceeding to the next step and if the sired results are not achieved in a certain predetermined time an alarm will be generated. The operator will have the ability to override and move to the next stage.

2. **Analog Data Scaling:** This control function shall scale all analog inputs to a common span and shall normalize the digital representation of each analog input to a percent of the operating span. The processed value shall be expressed as a binary number that specifies the analog input's position on a straight line lying between zero and full scale as defined for a given input by the zero span values in the data base.

3. **Amplitude Limit Check:** This control function shall perform dual level, high/low amplitude limit checking and shall identify a limit violation every time a measured or virtual variable goes out-of-limits and returns back into limits. The control unction shall determine the time at which each limit excursion occurred. A dead-band shall be provided on each limit and shall be expressed as a percentage of span or in engineering units.

4. **Engineering Unit Conversion:** This control function shall convert scaled analog data to engineering units by means of the following equation:

$$Y = (H - L) (D/DH) + L$$

where:

Y = value in engineering units

H = high value of span, expressed in engineering units

L = low value of span, expressed in engineering units

D = digitized scale input value in counts

DH = full scale digitized value in counts

5. Discrete Event Monitor: This control function shall monitor an alarm (where appropriate) all discrete status changes.

6. Manual Control: It shall be possible for the operator or plant engineer to interrupt any sequence, loop or automatic operation and operate the same manually from remote.

The following terms are used in the descriptions of DCS/PLC functions:

1. Operator Settings (Set points): Operator set or entered values that are adjustable or set from operator displays. Examples of operator set or entered values are controller set points, batch set points, timers, counters, mode selection, etc. Specific values that are required to be operator settable are noted (bracketed []) in the process control strategy descriptions. Unless otherwise stated to be tunable or fixed, a set point value is operator settable.

2. Tunable Values: Tunable values are set points that are adjustable at password protected engineer level displays without requiring any PLC or DCS software reconfiguration. Examples of tunable values are tunable time settings, tunable alarm set points, PID tuning constants, etc. These values are not adjustable from operator level displays. Tunable values are also identified and their preliminary values are shown in brackets [xxx].

3. Fixed Values: Fixed values are constants that are contained within the PLC or DCS control logic normally inaccessible by the DCS system. Modification of fixed values requires a modification to the control logic via the PLC programming, configuration and diagnostics software package.

4. Displayed Values: The term "displayed" means that the value, or information referred to, is displayed in an easily read and understood format on the DCS workstation. Values are identified by their device tag reference and associated equipment number. For analog variables the value is tagged and its associated engineering units are displayed.

5. Hardware Interlocks: Hardware interlocks refer to interlocks directly wired within the electrical control circuits of equipment that, when activated, shall cause the equipment to shutdown or otherwise prevent operation of the equipment. Hardware interlocks do not necessarily pass through or depend on the PLC or DCS to be operable.

Hardware interlocks may also be derived by local control panels or switches wired directly to the PLC or DCS to provide direct hardwired alarm status to the PLC or DCS for processing.

6. **Software Interlocks:** Software interlocks refer to interlocks that are generated by the PLC or DCS logic or otherwise pass through the PLC or DCS. Software interlocks are not operable when the PLC is not operable or if for some reason equipment is operated while by-passing the PLC logic.

7. **Hardware Generated Alarms:** Hardware generated alarms are alarms that are generated external to the PLC by equipment such as local control panels, analytical devices and process switches.

a. Direct wired alarms that do not depend on the PLC or DCS to be operable. An example would be a High H₂S level signal from the H₂S monitor and wired directly to an alarm light or horn.

b. Direct PLC wired alarms such as a High-High pressure switch that interfaces directly with the PLC.

8. **Software Generated Alarms:** Alarms that are processed or generated by PLC or DCS logic are referred as software generated. Software generated alarms are displayed on the DCS workstation alarm screens and are available for archiving.

9. **Local Automatic Control Mode:** Local automatic control refers to control logic performed in a local control panel independent of the PLC or DCS. An example is a standalone blower package that, when in the local automatic control mode, automatically controls the blower to maintained air pressure within a fixed dead band.

10. **Local Manual Control Mode:** Local manual control refers to the mode where operators control equipment from the equipment location. Examples are hoist and trolley that may be stopped or started from the compressor's local control panel (LCP), or a gate that may be opened or closed from the gate operator.

11. **DCS Automatic Control Mode:** In DCS automatic mode equipment is controlled automatically per predetermined control schemes residing in the DCS usually without operator intervention. However, in some cases the operators may be required to initiate certain automatic functions, or enter set points.

12. **DCS Manual Control Mode:** DCS manual control refers to the remote manual control of equipment from the DCS workstation. In this mode, the operators override the DCS automatic control logic but, usually, DCS safety interlock logic remains in effect.

13. **DCS Override Control:** DCS override control refers to the ability to override specific software interlocks and initiate control actions. Software interlocks or permissives that can be overridden are identified within the individual control strategies. Override control is an abnormal control operation and a "SAFETY INTERLOCK

“OVERRIDE ALARM” shall be initiated for the specific override condition whenever an override command is in effect.

COMMON DCS/PLC SOFTWARE FUNCTIONS

To provide for a standard of implementation, various software control and monitoring functions are defined. The standard functions may not be fully delineated within each control strategy, however, unless otherwise stated the standard function shall be utilized to provide the defined alarm, action, display or control action.

DCS is configured as the primary control system for all alarm monitoring, start/stop sequencing, shutdown and interlock and basic process control functions.

When delineated within individual control strategies as DCS controlled or DCS logic, the control program is resident within the DCS system. Complex control algorithms and historical data calculations are normally performed by the DCS system.

The following provides for common PLC and DCS software functions:

1. All equipment status items monitored by the DCS/PLC and generated within the DCS/PLC control strategies are displayed at the DCS. Unless otherwise specified the following is displayed for each equipment item:
 - a. Equipment READY status
 - b. Equipment RUNNING or ON status
 - c. Equipment OFF status
 - d. Equipment FAILURE alarm
 - e. Equipment FAIL-TO-OPERATE alarm
 - f. Equipment OUT-OF-SERVICE
2. All analog inputs transmitted to the DCS shall have instrument bad/failure indications or alarms when the input is below 0 percent or above 100 percent.
3. All discrete alarm and failure inputs are alarmed by the DCS application software and displayed at the DCS. Each discrete alarm input shall have an associated alarm delay that prevents nuisance tripping. A discrete alarm shall be generated based on a tunable set point of 10 seconds after the discrete event is initiated.
4. Where alarms are specified in the control strategy descriptions, those alarms are initiated by the DCS control logic based on the applicable analog input signals. User tunable trip points shall be provided for each analog input to establish High- High, High, Low, Low-Low, and Rate-Of-Change events. Each trip point shall be provided with a

user tunable dead band for set and reset operations. Individual signal trip points shall be provided with a tunable delay to alarm activation.

5. DCS alarm activation and annunciation shall adhere to a priority hierarchy that is established and maintained at the DCS system. Each alarm shall have an associated priority level defined as:

Level 1 - Life Threatening or Danger Conditions

Level 2 - Critical process alarms that shall create a plant shutdown condition, cause a critical process failure or severely hinder plant operation.

Level 3 - Minor process alarms associated with warning conditions and minor equipment failures.

Level 4 - Informational alarms shall not hinder operation or cause equipment failure.

6. All process related analog inputs are trended at the discretion of the operator.

7. All flow inputs and equipment run times are totalized, recorded and displayed at the DCS. Totalizers are resettable at the engineer level only.

8. Displays: DCS system shall have adequate number of displays for each system to enable the operator to effectively monitor and control the system. Displays are grouped functionally for ease of operation. Both analog and discrete functions associated with an item of equipment or a group of equipment shall be provided on the same display. Displays shall show process graphics, alarms, equipment status, system mode of operation, control strategy implementation, etc.

9. Most interlocks, permissives and start sequences are provided at the DCS level. Unless otherwise stated or shown, all discrete outputs shall be provided as follows:

a. For equipment START functions, the PLC or DCS shall issue a maintained START command until a RUNNING state is detected or the START command is removed.

b. When a momentary command is required, the PLC or DCS shall issue the command for a minimum 2 seconds, then remove the signal.

10. For equipment that the DCS/PLC is allowed to control, the DCS/PLC shall provide a FAIL-TO-OPERATE alarm if the equipment fails to comply with a DCS/PLC command signal. The (START, STOP, OPEN, CLOSE) shall have been present for more than a tunable time period. In this event, the command shall be removed subsequent to the expiration of the tunable time period.

11. In the event of a DCS system failure the system shall retain the last command from the DCS system for all equipment that is in service. All interlocks are enabled during a DCS communications or systems failure.

12. All PID control functions (P, PI, and PID) are provided with standard analog controller functions and operator interfaces including, but not limited to, the following:

a. AUTO/MANUAL mode selection: In AUTO, the output of controller shall be based on the PID control calculation. In MANUAL, the output of the controller shall be operator adjustable. Transfer between operational modes shall be bumpless.

b. LOCAL/REMOTE set point selection: In LOCAL, the set point shall be operator adjustable from the equipment. In REMOTE, the set point shall be adjustable from a REMOTE set point input.

c. Set point, process variable, and controller output shall be displayed. Provisions shall be included to prevent reset windup.

d. Dead band limits shall be placed on PID control algorithms to avoid hunting and continuous change actions. Dead band limits shall maintain a constant control until the process variable exceeds the dead band boundaries. A dead band value of zero shall disable the dead band.

e. Bumpless transition shall be provided when PID is invoked after a transition from manual to PID control or when pump start logic utilizes minimum speed controls for starting applications. The transition from current speed to calculated speed shall be provided as a user tunable set point percentage per second value.

13. When main equipment is tagged OUT-OF-SERVICE, a DCS function, all associated equipment and devices are automatically placed in OUT-OF-SERVICE status and their alarms inhibited until the tagged equipment is tagged IN SERVICE. Associated equipment for each piece of main equipment shall be determined on a case by case basis.

14. Verification of Result: Whenever a command is issued, DCS/PLC shall verify that its command is implemented before proceeding to the next step, e.g., a valve open command is issued, the DCS/PLC software shall verify that the valve open limit switch is activated after a preset time, before proceeding to the next step in the program. If no verification is received an alarm will be generated and operator intervention will be necessary to resume the automatic operation.

Detailed Control Strategies are attached:

CS-16, CS-37, CS-38, CS-39, CS-40, CS-41, and CS-42

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CONTROL STRATEGY 16 FERROUS CHLORIDE SYSTEM

Section includes bold font text utilized to identify additions and revisions from original control strategies to be applied upon installation of improvements. City staff shall prepare programming modifications to the DCS based upon this section. Contractor shall coordinate with City staff for implementation of the programming modifications and determination of any potential revisions or deletions to the strategy determined during construction.

Reference P&ID: 80-I-200, 80-I-201, 80-I-205, 80-I-206, 80-I-207, 80-I-208

Frequency of Operation: 1 Second

Control System Intercommunication:

1. Ferrous Chloride Bulk Storage and Handling System

A. General Description:

All the original ferrous chloride feed pumps were removed by the City and replaced with 2 new pumps. A third pump is being added under this project, which will result in a total of 3 ferrous chloride feed pumps. Each of the ferrous chloride feed pumps will have the ability to pump to anyone of the three digesters, thus pump control shall be based on call signals from any of the 3 digesters. Determination of flow to each digester will require manual operation of valves on the ferrous chloride room south wall.

1. The ferrous chloride system consists of two ferrous chloride day tanks and **three** ferrous chloride feed pumps.
2. The ferrous chloride system will be used to supply ferrous chloride to the digesters for hydrogen sulfide control. The operator will determine when and how much ferrous chloride to add to a digester.
3. The ferrous chloride system **requires manual operation of the valves to select which digester(s) to pump to. The ferrous chloride feed pumps** can be automatically controlled by the DCS.
4. The ferrous chloride **feed pumps** can be manually controlled by the operator via the DCS.

B. Related Equipment:

<u>Equipment</u>	<u>Equipment Numbers</u>
Ferrous Chloride Day Tanks	80-T-01, 80-T-02
Tank Level Sensors	80LIT2710, 80LIT2715
Tank Level Switches	80LSH2711, 80LSL2711, 80LSH2716, 80LSL2716
Ferrous Chloride Feed Pumps	80-P-80, 80-P-81, 80-P-82
Ferrous Chloride Discharge Meters	80-FE-2725, 80-FE-2730, 80-FE-2735

C. Overview of Strategy:

1. This system consists of **three** feed pumps and two day tanks.
2. The system has been designed so **that any of the three feed pumps can pump to any of the three digesters, depending on manual valve position. The operator shall select which feed pump is assigned to which digester based on the piping connection and manual valve positions.** All pumps can be fed from either day tank.
3. The operator will establish when and how much ferrous chloride to add to each digester.
4. When the DCS is operating, the speed of each pump will be controlled by a software flow controller.
5. DCS to monitor and record the following:
 - a. Open/close, thermal overload, fuse blown, torque and hand switch status of all ferrous chloride routing valves from the ferrous chloride transfer pumps in the chemical building to the ferrous chloride day tanks.
 - b. Ferrous chloride day tank levels and low and high level switch status.
 - c. Ferrous chloride feed pumps ready, run, speed, fail and hand switch status.
 - d. Ferrous chloride feed pump discharge flow.
 - e. Open/close, thermal overload, fuse blown, torque and hand switch status of all ferrous chloride feed pump isolation and routing valves **directly upstream and downstream of the feed pump.**
 - f. Day tank discharge line hand valve open/close status.
 - g. Containment area flood switch status.

D. Computer Control Functions:

1. Manual Control:
 - a. Open/close all ferrous chloride system routing and pump isolation valves.
 - b. Start/stop and adjust flow rate of each ferrous chloride feed pump.

2. Automatic Control:

- a. **Operator to select digester(s) to feed.**
- b. **Operator to physically open/close manual valves on ferrous chloride chemical room south wall to create open flow path to digester(s) selected, and to confirm valves are closed for digester(s) not selected.**
- c. Operator to select first day tank to operate.
- d. If pump 1 is to be used **as primary feed pump**, operator to select pump 1 for use and indicate the digester to which it will pump.
- e. **Operator to enter ferrous chloride feed rate.**
- f. Not used.
- g. DCS to scan all I/O associated with the strategy and indicate ready or not ready,
- h. If ready, operator to initiate start-up sequence which will:
 - (1) Check that the discharge line hand valve for the first day tank is open **and the valve for the second day tank is closed**; upon confirmation,
 - (2) Open the first day tank's discharge valves (open and confirm the valve furthest from the day tank first, then open and confirm the valve closest to the day tank and confirm); upon confirmation,
 - (3) **Not used.**
 - (4) **Start feed pump 1** and initiate control of the pump.
 - (5) If pump 1 **is** selected for operation:
 - i. Open the routing valve from pump 1 to the discharge header of the pump associated with the digester to which pump 1 will pump; upon confirmation,
 - ii. **Confirm the operator opened the manual feed valves (south wall) by asking for electronic question confirmation; upon confirmation,**
 - iii. Start pump 1

- iv. Initiate control of the pumps.
- i. **Not used**
- j. **Not used.**
- k. During operation, when the DCS is operating, the speed of each ferrous chloride pump that is operating will be controlled by a software flow controller to maintain the set point flow rate (entered by operator). Adjust the pump speed in accordance with the following variables: Set Point - operator entered flow set point, Primary Process Variable - actual discharge flow. The controller will output the speed signal to the pump VFD.
- l. During operation, if continuous feed is selected, strategy will stop each pump when requested by the operator.
- m. Not used.
- n. During operation, day tanks will operate as follows:
 - (1) When the first day tank reaches the low level alarm, second day tank discharge line hand valve open status will be confirmed; upon confirmation, discharge valves will open (open furthest valve from tank first and confirm then open valve closest to tank and confirm) and first day tanks discharge valves will close and inlet valve will open.
 - (2) When the second day tank reaches the low level alarm, first day tank discharge line hand valve open status will be confirmed; upon confirmation, discharge valves will open (open furthest valve from tank first and confirm then open valve closest to tank and confirm) and second day tanks discharge valves will close and inlet valve will open.
 - (3) This will be a continuous cycle.
 - (4) Day tank fill will be performed by another strategy (Strategy 38). Day tank inlet valve to close on high level alarm.
- o. During operation, if one of the feed pumps fails, **the DCS shall issue a pump FAIL alarm.**
- p. If the operator selects to place a day tank OUT OF SERVICE, strategy will close all inlet and outlet valves of that tank, inhibit control (manual and automatic) of these valves from the DCS and indicate that the tank is OUT OF SERVICE. When the tank is selected to be placed back IN SERVICE, strategy will reestablish control of the inlet and outlet valves from the DCS.

q. Process interlocks: Ferrous Chloride feed pumps will stop and an alarm will be issued if any of the following events occur:

- (1) Low level alarm in both day tanks.
- (2) Day tank OUT OF SERVICE and operating day tank level falls to the low level alarm level.
- (3) Actual feed rate falls below operator entered feed rate for time period (adjustable 0-5 minutes, initial 1 minute).

END OF CONTROL STRATEGY

Control Strategy 37 Polymer Bulk Storage Handling Systems

Section includes bold font text utilized to identify additions and revisions from original control strategies to be applied upon installation of improvements. City staff shall prepare programming modifications to the DCS based upon this section. Contractor shall coordinate with City staff for implementation of the programming modifications and determination of any potential revisions or deletions to the strategy determined during construction.

Reference P&ID 60-I-10, 60-I-11, 60-I-12, 60-I-20, 60-I-21, 60-I-22, 60-I-23,
60-I-30, 60-I-31, 60-I-32, 60-I-33, 60-I-34, 60-I-37, 60-I-38,
60-I-39

Frequency of Operation 1 Second

Control Strategies:

A. General Description:

1. **In 2014, modifications that will be made to the control system, piping, valves and pumps to provide additional operation flexibility and to remove the use of Emulsion polymer entirely. In addition, the dilution / dispersion units will be removed and a polymer mixing transfer pump (60-P-11) to be replaced with a new transfer pump to match Pumps 60-P-12 and 60-P-13. This control strategy includes revisions to address the improvements planned for 2014.**
2. **This system consists of two polymer storage/handling/transfer systems. One system transfers the polymer (Mannic) from the storage tanks to the mixing tanks. The second system transfers to polymer from the mixing tanks to the centrifuge day tanks.**
3. **The system is designed to handle Mannic polymer.**
4. **The system will run as follows: Trucks fill the bulk storage tanks via the fill stations, bulk transfer pumps transfer the polymer from the bulk tanks to mixing tanks, another set of pumps transfer the mixed polymer to the centrifuge building day tanks.**
5. **The complete polymer storage /handling/transfer system can be automatically controlled by the DCS.**

6. The complete polymer storage/handling/transfer system can be manually controlled by the operator via the DCS.

B. Related Equipment:

<u>Equipment</u>	<u>Equipment Number</u>
Fill Stations	60PNL01, 60PNL02, 60PNL03
Polymer Bulk Storage Tanks	60-T-01, 60-T-02, 60-T-11, 60-T-12, 60-T-13, 60-T-14
Polymer Bulk Storage Transfer Pumps	60-P-01, 60-P-02, 60-P-06, 60-P-07
Polymer Mix Tanks	60-T-21, 60-T-22, 60-T-23, 60-T-24
Polymer Transfer Pumps	60-P-11, 60-P-12, 60-P-13
Polymer Flow Meters	60FIT2171, 60FIT2181
Tank Level Sensors	60LIT2100, 60LIT2105, 60LIT2130, 60LIT2135 60LIT2140, 60LIT2145, 60LIT2172, 60LIT2177 60LIT2182, 60LIT2187
Polymer Water Flow Meters	60FIT2170, 60FIT2175, 60FIT2180, 60FIT2185
Mixers	60-M-21, 60-M-22, 60-M-23, 60-M-24
Low Level Switches	60LSL2101, 60LSL2106, 60LSL2131, 60LSL2136, 60LSL2141, 60LSL2146
High Level Switches	60LSH2101, 60LSH2106, 60LSH2131, 60LSL2136, 60LSH2141, 60LSH2146

C. Overview of Strategy:

1. This system feeds polymer **from the storage tanks** to the centrifuges.
2. Mannic polymer **shall** be used.
3. Polymer will be transferred from bulk storage tanks using bulk transfer pumps to mixing tanks where water will be added and the polymer and water will be mixed. The amount of water added will be determined by the DCS in response to the flow of polymer to the mixing tank and the dilution ratio entered by the operator.
4. Mixed polymer solution will be pumped to the centrifuge day tanks (either dewatering centrifuge day tanks or thickening centrifuge day tanks) in response to low level indication from those tanks.
5. DCS to MONITOR and RECORD the following:
 - a. Bulk polymer storage tank levels.
 - b. Valve status (Open/Close, thermal overload, fuse blown, torque, hand switch) for all polymer system routing valves.
 - c. Transfer pumps (bulk polymer and mixed polymer) ready, run, and hand switch status.
 - d. Both polymer and dilution water flows into mixing tanks.
 - e. Polymer mixing tank level and level switch (low, middle, high) status.
 - f. Polymer mixing tank mixer ready, run and hand switch status.
 - g. Polymer system containment area flood switch status.
 - h. Polymer system containment area (precipitation) high level indicator status.**
 - i. Low and high level switch status in bulk storage tanks.
 - j. Bulk transfer pumps and mixed polymer transfer pumps suction and discharge low pressure switch status and discharge high pressure switch status.
 - k. Valve status (open/close, thermal overload, fuse blown, torque, hand switch) for polymer mixing tank dilution water inlet valve.

D. Computer Control Functions:

1. Manual Control

- a. Open/Close each polymer system routing valve.
- b. Start/Stop each polymer transfer pump.
- c. Open/Close each polymer mixing tank's dilution water valve.
- d. Start/Stop each polymer mixing tank's mixer.

2. Automatic Control

- a. For **all systems** the following strategy is identical.

- 1) Operator to select mannitic polymer in the bulk storage tank of the system selected.

- a) The operator will select the Tank 1, 2, **11, 12, 13 or 14** to be placed **IN SERVICE from the Title Bar**.

- b) When the Delivery trucks fill the bulk storage tanks via the fill stations, the level indicator in the tank will raise which indicates that Mannitic Polymer may be selected.

1. Operator will select the lead bulk transfer pump next. The remaining pump becomes standby. If polymer is selected operator will select the lead bulk recirculation/transfer pump and the other becomes standby.

- 2) Operator will select mixing tanks to be used for the system. Since the mixing tanks can be used by **any combination of pumps**, if a mixing tank is already being used it will not be available for use.

- a) When the Mixing Tank Title Bar is selected the Select/Deselect buttons may be selected. The In/Out of Service buttons may also be selected.

- c. DCS to scan all I/O associated with strategy and indicate ready or not ready.

- 1) Once the Strategy Ready button is illuminated, the Start button becomes enabled and may be selected. Once the START button is

selected, a window asking if the operator is sure the strategy should initiate appears. Selecting "Yes" enters the command and initiates the strategy.

d. If ready, operator to initiate start-up strategy which will:

- 1) Open both discharge valves for bulk storage tanks to be placed IN SERVICE.
- 2) Open the bulk polymer transfer pump main discharge header valve that leads to the mixing tank feed header.
- 3) Open the appropriate routing valves in the polymer mix tank distribution header so that polymer can be transferred to the polymer mixing tanks.
- 4) Open the appropriate mixed polymer transfer pump suction header valves (valves of concern 60MV1200, 60MV1201) to route mixed polymer from the mix tank(s) selected for this system to the transfer pumps selected for this system.
- 5) Open the appropriate mixed polymer transfer pump discharge header valves to route mixed polymer from the transfer pump for this system to the Centrifuge building day tanks for this system.
- 6) During operation, when a polymer mixing tank selected for the system reaches the low level set point, strategy will:
 - i. Determine the volume of bulk polymer and volume of water required to prepare the set point volume of mixed polymer.
 - ii. Start the lead bulk polymer transfer pump (mannic).
 - iii. When the calculated volume of water has been added or the tank reaches the high level alarm level, close the mixing tank water line inlet valve.
 - iv. When the calculated volume of bulk polymer has been added or the tank reaches the high alarm level, stop the transfer pump (mannic) and close the tank's polymer inlet valve.
 - v. Open the mixing tank water line inlet valve.

- vi. If the water line valve is closed or the transfer pump (mannic) is stopped due to high level in the mixing tank, strategy will issue an alarm and issue a message indicating that water and/or polymer transfer was stopped due to high level in the tank.
- 7) During operation if the lead bulk transfer pumps (mannic) fails, the respective stand by unit will start and the failed unit will stop.
- 8) During operation, mixing tank mixers will start when Solution rises to a set level (adjustable 0 to 16.25, **initially set to x ft**) and stop when the solution falls to a set level (adjustable 0 to 16.25, **initially set to x ft**).
- 9) If polymer is being recirculated in the bulk storage tank to keep it mixed. Strategy will provide for this mixing as follows.
- i. On a preset cycle (adjustable 0-24 minutes, initial per - polymer manufacturer's recommendations), strategy will start the lead transfer pump, let the pump run for a time period (adjustable 0-60 minutes, initial per **polymer** manufacturer's recommendations), then stop the transfer pump. Cycle will be continuous.
 - ii. During recirculation operation, strategy will inhibit the sub strategy that keeps record when the tank is filled. (See Below)
- 10) To keep a record of when each storage tank is filled, strategy will record the date and time at which a level transmitter in a tank begins to record an increase in level. At that time, strategy will record the level at which the fill started and the level at which the fill ended.
- 11) If a bulk storage tank is selected to be taken OUT of SERVICE, strategy will close the outlet valves for that tank, inhibit control of the valves from the DCS and indicate that the tank is OUT of SERVICE. When the tank is selected to be placed back IN SERVICE, strategy will reestablish control of the outlet valves.
- i. Tanks may be taken IN/OUT of SERVICE by selecting the

appropriate button under the Tank 1 or Tank 2 Title Bar on the Polymer Control Strategy Screen.

- 12) If a mixing tank is selected to be taken OUT OF SERVICE, strategy will close the inlet polymer valve, the inlet water valve and the outlet valves, stop the mixer, inhibit control of the valves from the DCS and indicate that the tank is OUT of SERVICE. When the tank is selected to be placed back IN SERVICE, strategy will reestablish control of the valves and the mixer.
- e. During operation, an alarm will be indicated to the operator upon spill detection in the Mixing Tank Containment area. **Two basin level switches are present: (Lower Placement) Precipitation alarm for indication purposes (such as rainfall) and (Higher Placement) for basin flood alarm (such as possible spill).**
 - f. The mixed polymer transfer pumps are arranged as follows:
 - 1) **Pumps can universally transfer mixed polymer to either dewatering or thickening centrifuge day tanks.**
 - 2) When a day tank reaches the low level alarm set point and the inlet valve to that day tank is opened (valve will be opened by the day tank control strategy) strategy will fill the tank as follows:
 - i. Open both outlet valves of the appropriate polymer mixing tank(s) (appropriate mix tank(s) are the tank(s) designated for that system).
 - ii. Start the associated transfer pumps.
 - iii. When the day tank level reaches the high level, strategy will stop the transfer pump up confirmation.
 - iv. Close the mixing tank outlet valves.
 - v. During operation, if a mixed polymer transfer pump fails and the standby pump is available, strategy will open the appropriate suction header valve and discharge header valve to the standby pump and stop the failed pump. Start/Stop the standby pump as the failed pump would be controlled.

v. Process Interlocks:

- 1) Bulk transfer pump units will stop upon bulk tank low level alarm.
- 2) Mixed Polymer transfer pumps to stop upon low level alarm in selected mixing tank.
- 3) All mixed Polymer transfer pumps will stop upon leak detection in day tank containment areas at the centrifuge building.

w. Failure Response

- 1) Upon loss of polymer transfer pump, loss of communication with area 76 PCMs, or process mixing water flow signals, stop transfer pumps and close mixing water feed valve and alarm operator.

E. Control System Intercommunications:

Process I/O

Process Inputs

A. Analog

B. Discrete

Process Outputs

A. Analog

B. Discrete

Alarms and Displays

END OF CONTROL STRATEGY

Control Strategy 38

Ferrous Chloride Bulk Storage Handling System

Section includes bold font text utilized to identify additions and revisions from original control strategies to be applied upon installation of improvements. City staff shall prepare programming modifications to the DCS based upon this section. Contractor shall coordinate with City staff for implementation of the programming modifications and determination of any potential revisions or deletions to the strategy determined during construction.

Reference P&ID 60-I-130, 60-I-131

Frequency of Operation 1 Second

CONTROL STRATEGIES:

The pumping strategy will remain the same, but several motor operated valves are being replaced with new motor operated valves. Position status limit switches are being provided for hand valves 60HV1451 and 60HV1456. A spill containment high-high level switch will be provided for monitoring for a spill containment alarm.

A. General Description

1. The ferrous chloride bulk storage and handling system consists of two
2. The ferrous chloride bulk storage and handling system can be
3. The ferrous chloride bulk storage and handling system can be manually

B. Related Equipment:

<u>Equipment</u>	<u>Equipment Number</u>
Fill Stations	60PNL05
Ferrous Chloride Storage Tanks	60-T-81, 60-T-82
Ferrous Transfer Pumps	60-P-71, 60-P-72
Tank Level Sensors	60LIT2450, 60LIT2455
Level Switches	60LSL2451, 60LSL2456, 60LSH2451 60LSH2456, 60LSHH2457

C. Overview of Strategy:

1. The ferrous chloride is delivered by truck. The truck will pump ferrous chloride into the proper ferrous chloride bulk storage tank and the fill station will indicate tank level and alarm on high level.
2. The bulk storage tank levels are monitored by the DCS along with both

high and low level switches.

3. The ferrous chloride transfer pumps pumping program is designed as a one pump program with one pump standby with manual alternation as selected by the DCS operator. The transfer pump will start when it receives a low day tank level signal and will continue to pump until the high tank signal is received from the day tank to which the pump is pumping.
4. Strategy will include recirculation cycle to keep the ferrous chloride mixed.
5. DCS to monitor and Record the following:
 - a. Bulk ferrous chloride storage tank levels.
 - b. Open/Close status of ferrous chloride system routing valves.
 - c. Transfer pumps ready, run, and hand switch status.
 - d. Spill containment area high **and high-high** level switch status.
 - e. Storage tank high and low level switch status.
 - f. Pump isolation valves thermal overload, fuse blown, torque, open/close and switch status.
 - g. Transfer pump discharge header valves thermal overload, fuse blown, torque, open/close and hand switch status.

D. Computer Control Functions

1. Manual Control
 - a. Open/Close each motor operated ferrous chloride system routing valve.
Clicking on a valve accesses a controller faceplate that provides push buttons for Open/Close Manual control.
 - b. Start/Stop each ferrous chloride transfer pump.
Clicking on a pump accesses a controller faceplate that provides push buttons for Start/Stop Manual control.
2. Automatic Control
 - a. Operator to select ferrous chloride storage and handling strategy. (Graphic No. 2742) This strategy may be accessed by clicking on the "Control Strategy" Open Look Button on the Ferrous Chloride Block Diagram or Isometric graphic (2718& 2719).
 - b. Operator to select lead pump. The other pump will become stand by. The operator will select the "Lead" Open Look Button for either pump 1 or pump 2. The remaining pump will be designated as the standby.

- c. DCS to scan all I/O associated with the strategy and indicate ready or not ready.
- d. If ready, the "Start" Button may be pressed, initiating automatic pump control strategy which will:
 - 1) Confirm the status of all monitored hand valves between ferrous tanks and transfer pumps. If at least one valve from a tank not at low level is not open, strategy will indicate this to the operator.
 - 2) Upon low level alarm for a ferrous chloride day tank for which the inlet valve is open (day tank strategy will open the inlet valve), open the main transfer pump discharge header valve and start the lead transfer pump.
 - 3) Upon high level alarm for the day tank to which the transfer pump is pumping, stop the lead transfer pump and close the main transfer pump discharge header valve.
 - 4) During operation if lead pump fails, standby will start; upon confirmation, lead will stop.
- e. To keep a record of when each storage tank is filled, strategy will record the date and time at which a level transmitter in a tank begins to record an increase in level. At that time strategy will record the level at which the fill started and the level at which the fill stopped.
- f. During operation, an alarm will be indicated to the operator upon spill detection in the storage tank containment area.
- g. Every 24 hours, strategy will provide mixing sequence to mix the ferrous chloride. For each tank, sequence will be as follows:
 - 1) Check that the lead pump is not already operating. If it is, delay sequence until pump is operating. If it is not, continue.
 - 2) Open the recirculation valve upon confirmation.
 - 3) Check that at least one hand valve of tank to be mixed is in the open position; upon confirmation.
 - 4) Start the lead pump and run for 1 hour then stop the pump and close the recirculation valve.
 - 5) During mixing sequence inhibit the substrategy that keeps record of the tank fill.
- h. Process Interlocks: The following will stop both transfer pumps.
 - 1) Low level in operational ferrous storage tank(s). Tank is operational if the suction line monitored hand valves are open.

- 2) Leak detection in the ferrous day tanks containment structure in the digester complex.
- 3) Neither storage tank is operational. Tank is operational if the suction line monitored hand valves are open.

I. Failure Responses:

- 1) Upon loss of communications with Area 80 PCMs, stop transfer pumps.

E. Control System Intercommunication:

- 1) Ferrous Chloride System.

Process I/O

Process Inputs

A. Analog: **No new analog inputs.**

B. Discrete

1. **60LSHH2457 Spill Containment Flood Alarm**
2. **60ZDI1451 Valve 60HV1451 Open/Close Status**
3. **60ZBI1451 Valve 60HV1451 Open/Close Status**
4. **60ZDI1456 Valve 60HV1456 Open/Close Status**
5. **60ZBI1456 Valve 60HV1456 Open/Close Status**

Process Outputs

A. Analog: **No new analog outputs.**

B. Discrete: **No new discrete outputs.**

Alarms and Displays

Spill containment level high-high alarm.

END OF CONTROL STRATEGY

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Control Strategy 39

Ferric Chloride Bulk Storage Handling System

Section includes bold font text utilized to identify additions and revisions from original control strategies to be applied upon installation of improvements. City staff shall prepare programming modifications to the DCS based upon this section. Contractor shall coordinate with City staff for implementation of the programming modifications and determination of any potential revisions or deletions to the strategy determined during construction.

Reference P&ID 60-I-135, 60-I-136

Frequency of Operation 1 Second

CONTROL STRATEGIES:

The pumping strategy will remain the same, but several motor operated valves are being replaced with new motor operated valves. Position status limit switches are being provided for hand valves 60HV1481 and 60HV1486. A spill containment high-high level switch will be provided for monitoring for a spill containment alarm.

A. General Description

1. The Ferric Chloride bulk storage and handling system consists of two bulk storage tanks and two transfer pumps which transfer Ferric Chloride to day tanks in the Centrifuge building.
2. The Ferric Chloride bulk storage and handling system can be automatically controlled by the DCS.
3. The Ferric Chloride bulk storage and handling system can be manually controlled by the operator via the DCS.

B. Related Equipment:

<u>Equipment</u>	<u>Equipment Number</u>
Fill Stations	60PNL04
Ferric Chloride Storage Tanks	60-T-71, 60-T-72
Ferric Transfer Pumps	60-P-73, 60-P-74
Tank Level Sensor	60LIT2480, 60LIT2485
Level Switches	60LSL2481, 60LSL2485, 60LSH2481 60LSH2486, 60LSHH2487

C. Overview of Strategy:

1. The Ferric Chloride is delivered by truck. The truck will pump ferric chloride into the proper Ferric Chloride bulk storage tank and the fill station will indicate tank level and alarm on high level.
2. The bulk storage tank levels are monitored by the DCS along with both high and low level switches.
3. The Ferric Chloride transfer pumps pumping program is designed as a one pump program with one pump standby with manual alternation as selected by the DCS operator. The transfer pump will start when it receives a low day tank level signal and will continue to pump until the high tank signal is received from the day tank to which the pump is pumping.
4. Strategy will include recirculation cycle to keep the Ferric Chloride mixed.
5. DCS to monitor and Record the following:
 - a. Bulk Ferric Chloride storage tank levels.
 - b. Open/Close status of Ferric Chloride system routing valves.
 - c. Transfer pumps ready, run, and hand switch status.
 - d. Spill containment area high level **and high-high level** switch status.
 - e. Storage tank high and low level switch status.
 - f. Pump isolation valves thermal overload, fuse blown, torque, open/close and hand switch status.
 - g. Transfer pump discharge header valves thermal overload, fuse blown, torque, open/close and hand switch status.

D. Computer Control Functions

1. Manual Control
 - a. Open/Close each motor operated Ferric Chloride system routing valve.
Clicking on a valve accesses a controller faceplate that provides push buttons for Open/Close Manual control.
 - b. Start/Stop each Ferric Chloride transfer pump.
Clicking on a pump accesses a controller faceplate that provides push buttons for Start/Stop Manual control.
2. Automatic Control
 - a. Operator to select Ferric Chloride storage and handling strategy.

(Graphic No. 2743) This strategy may be accessed by clicking on the "Control Strategy" Open Look Button on the Ferric Chloride Block Diagram or Isometric graphic (2718& 2719).

- b. Operator to select lead pump. The other pump will become stand by. The operator will select the "Lead" Open Look Button for either pump 1 or pump 2. The remaining pump will be designated as the standby.
- c. DCS to scan all I/O associated with the strategy and indicate ready or not ready.
- d. If ready, the "Start" Button may be pressed, initiating automatic pump control strategy which will:
 - 1) Confirm the status of all monitored hand valves between ferric tanks and transfer pumps. If at least one valve from a tank not at low level is not open, strategy will indicate this to the operator.
 - 2) Upon low level alarm for a Ferric Chloride day tank for which the inlet valve is open (day tank strategy will open the inlet valve), open the main transfer pump discharge header valve and start the lead transfer pump.
 - 3) Upon high level alarm for the day tank to which the transfer pump is pumping, stop the lead transfer pump and close the main transfer pump discharge header valve.
 - 4) During operation if lead pump fails, standby will start; upon confirmation, lead will stop.
- e. To keep a record of when each storage tank is filled, strategy will record the date and time at which a level transmitter in a tank begins to record an increase in level. At that time strategy will record the level at which the fill started and the level at which the fill stopped.
- f. During operation, an alarm will be indicated to the operator upon spill detection in the storage tank containment area.
- g. Every 24 hours, strategy will provide mixing sequence to mix the Ferric Chloride. For each tank, sequence will be as follows:
 - 1) Check that the lead pump is not already operating. If it is, delay sequence until pump is operating. If it is not, continue.
 - 2) Open the recirculation valve upon confirmation,
 - 3) Check that at least one hand valve of tank to be mixed is in the open position; upon confirmation,
 - 4) Start the lead pump and run for 1 hour then stop the pump

and close the recirculation valve.

- 5) During mixing sequence inhibit the substrategy that keeps record of the tank fill.
- h. Process Interlocks: The following will stop both transfer pumps.
- 1) Low level in operational ferric storage tank(s). Tank is operational if the suction line monitored hand valves are open.
 - 2) Leak detection in the ferric day tanks containment structure in the digester complex.
 - 3) Neither storage tank is operational. Tank is operational if the suction line monitored hand valves are open.
- i. Failure Responses:
- 1) Upon loss of communications with Area 76 PCMs, stop transfer pumps.

E. Control System Intercommunication:

- 1) Dewatering Ferric Chloride System.

Process I/O

Process Inputs

A. Analog: **No new analog inputs.**

B. Discrete:

1. **60LSHH2487 Spill Containment Flood Alarm**
2. **60ZDI1481 Valve 60HV1481 Open/Close Status**
3. **60ZBI1481 Valve 60HV1481 Open/Close Status**
4. **60ZDI1486 Valve 60HV1486 Open/Close Status**
5. **60ZBI1486 Valve 60HV1486 Open/Close Status**

Process Outputs

A. Analog: **No new analog outputs.**

B. Discrete: **No new discrete outputs.**

Alarms and Displays

Spill containment level high-high alarm.

END OF CONTROL STRATEGY.

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CONTROL STRATEGY 40

CAUSTIC SODA BULK STORAGE HANDLING SYSTEM

Section includes bold font text utilized to identify additions and revisions from original control strategies to be applied upon installation of improvements. City staff shall prepare programming modifications to the DCS based upon this section. Contractor shall coordinate with City staff for implementation of the programming modifications and determination of any potential revisions or deletions to the strategy determined during construction.

Reference P&ID 60-I-100

Frequency of Operation 1 Second

CONTROL STRATEGIES:

A. General Description

The existing control strategy will remain in place. A spill containment high-high level switch will be added to monitor for a spill containment alarm condition.

1. The Caustic Soda Bulk Storage and Handling System consists of two bulk storage tanks four feed pumps and two transfer pumps.
2. The Feed Pumps will transfer Caustic Soda to the Odor Control System.
3. The Transfer Pumps will transfer Caustic Soda to Day Tanks at the Digester Complex and Wastewater Pump Station.
4. The Caustic Soda Bulk Storage and Handling System can be automatically controlled by the DCS.
5. The Caustic Soda Bulk Storage and Handling System can be manually controlled by the operator via the DCS.

B. Related Equipment:

<u>Equipment</u>	<u>Equipment Number</u>
Fill Stations	60PNL08
Caustic Soda Storage Tanks	60-T-41, 60-T-42
Caustic Feed Pumps	60-P-41, 60-P-42, 60-P-43, 60-P-44
Caustic Transfer Pumps	60-P-46, 60-P-47
Tank Level Sensor	60LIT2300, 60LIT2305
Level Switches	60LSH2301, 60LSH2306, 60LSL2301 60LSL2306 , 60LSHH2307

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MBC CHEMICAL SYSTEMS IMPROVEMENTS – PHASE II

APPENDIX A – CONTROL STRATEGIES
SECTION 13300A – CS40-1
CAUSTIC SODA BULK STORAGE

C. Overview of Strategy:

1. The Caustic Soda is delivered by truck. The truck will pump Caustic Soda into the proper Caustic Soda Bulk Storage Tank and the fill station will indicate tank level and alarm on high level.
2. The Bulk Storage Tank levels are monitored by the DCS along with both high and low level switches.
3. The Bulk Storage Tank Levels and low and high level switches of each tank are monitored by the DCS.
4. Each Caustic Soda Feed Pump will Pump Caustic Soda to its respective Scrubber based on the pH signal as recommended by the Odor Control System Supplier.
5. Caustic Soda Feed Pump No. 4 has been designed as the Standby Feed Pump and will automatically replace any failed Feed Pump.
6. The Caustic Soda Transfer Pumps pumping program is designed as a one pump program with one pump standby with manual alternation as selected by the DCS operator. The Transfer Pump will start when it receives a low day tank level signal and will continue to pump until the high tank signal is received from the day tank to which the pump is pumping.
7. DCS to monitor and Record the following:
 - a. Bulk Caustic Soda storage tank levels.
 - b. Open/Close status of Caustic Soda system routing valves.
 - c. Feed Pumps ready, run , and hand switch status.
 - d. Transfer Pumps ready, run , and hand switch status.
 - e. Spill containment area high level **and high-high level** switch status.
 - f. Transfer Pump discharge header valves thermal overload, fuse blown, torque, open/close and hand switch status.
 - g. Pump isolation valves thermal overload, fuse blown, torque, open/close and switch status.
 - h. Feed Pump No. 4 routing valve thermal overload, fuse blown, torque, open/close and hand switch status.
 - i. Storage Tank high and low level switch status.

D. Computer Control Functions

1. Manual Control
 - a. Open/Close each motor operated Caustic Soda System routing

valve.

Clicking on a valve accesses a controller faceplate that provides push buttons for Open/Close Manual control.

b. Start/Stop each Caustic Soda Transfer Pump.
Clicking on a pump accesses a controller faceplate that provides push buttons for Start/Stop Manual control.

c. Adjust speed of each Caustic Soda Feed Pump.
Clicking on a pump accesses a controller faceplate that provides a Raising/Lowering level meter for Adjust Speed Manual control.

2. Automatic Control

a. Feed Pumps

1. When Wet Scrubber No. 2 of an odor control train is placed IN SERVICE the related Caustic Soda Feed Pump and Caustic Soda Feed Pump No. 4 will be placed IN SERVICE.

2. Upon Initiation of Feed Pump control (see Main Odor Control Strategy), strategy will confirm status of all monitored hand valves between Caustic Soda Tanks and Feed Pumps. If at least one valve to a tank that is not at low level alarm is not open, strategy will indicate to operator.

3. During operation, strategy will Start/Stop the Scrubber's Caustic Soda feed pump to maintain the ph level set point (entered by the operator in the Odor Control Strategy) for that Scrubber. Pump speed (entered by the operator in the Odor Control Strategy) will be output to the pump VFD while the pump is IN SERVICE.

4. Automatic control of a feed pump will be inhibited while the associated Scrubber is OUT OF SERVICE.

5. During operation, if feed pump fails and if Feed Pump No. 4 is available, strategy will open pump No. 4 discharge routing valve to the failed pump discharge line and initiate control of pump No. 4 (control as failed pump was being controlled); upon confirmation, stop failed pump and alarm.

b. Transfer Pumps

Operator to select Caustic Soda Storage and Handling Strategy. (Graphic No. 2744) This strategy may be accessed by clicking on the "Control Strategy" Open Look Button on the Caustic Soda Block Diagramsometric graphic (2754 & 2752).

c. Operator to select lead pump. The other pump will become stand by.

The operator will select the “Lead” Open Look Button for either pump 1 or pump 2. The remaining pump will be designated as the standby.

- d. DCS to scan all I/O associated with the strategy and indicate ready or not ready.
- e. If ready, the “Start” Button may be pressed, initiating automatic pump control strategy which will:
 - 1) Confirm the status of all monitored hand valves between Caustic Soda Tanks and transfer pumps. If at least one valve from a tank not at low level is not open, strategy will indicate this to the operator.
 - 2) Upon low level alarm for a Caustic Soda Day Tank (either at the Wastewater Pump Station or the Digester complex), for which the inlet valve is open (Day Tank Strategy will open the inlet valve), open the main transfer pump discharge header valve (appropriate valve is the one that leads to the Day Tank that needs to be filled), and start the lead Transfer Pump.
 - 3) Upon high level alarm for the day tank to which the Transfer Pump is pumping, stop the lead transfer pump and close the main transfer pump discharge header valve.
 - 4) During operation if lead pump fails, standby will start; upon confirmation, lead will stop.
- e. To keep a record of when each Storage Tank is filled, strategy will record the date and time at which a level transmitter in a tank begins to record an increase in level. At that time strategy will record the level at which the fill started and the level at which the fill stopped.
- f. During operation, an alarm will be indicated to the operator upon spill detection in the Storage Tank containment area.
- g. Process Interlocks
 - 1) Low level in operational Caustic Storage Tank(s). Tank is operational if the suction line monitored hand valves are open.
 - 2) Prevent Caustic Transfer to the Wastewater Pump Station upon leak detection in the day tanks containment structure.
 - 3) Stop Feed and Transfer Pumps if neither Storage Tank is operational. Tank is operational if the suction line monitored hand valves are open.
- i. Failure Responses:

- 1) Upon loss of communications with Area 80 or 94 PCMs, stop the transfer pumps if pumping to that area..

E. Control System Intercommunication:

- 1) Caustic Soda System.
- 2) Centrate/Wastewater Pump Station Chemical Feed System.
- 3) Main Odor Control System

Process I/O

Process Inputs

A. Analog : **No new analog inputs.**

B. Discrete: **Spill containment level high-high.**

Process Outputs

A. Analog: **No new analog outputs.**

B. Discrete: **No new discrete outputs.**

Alarms and Displays

Spill containment level high-high alarm.

END OF CONTROL STRATEGY

Control Strategy 41

Sulfuric Acid Bulk Storage Handling System

Section includes bold font text utilized to identify additions and revisions from original control strategies to be applied upon installation of improvements. City staff shall prepare programming modifications to the DCS based upon this section. Contractor shall coordinate with City staff for implementation of the programming modifications and determination of any potential revisions or deletions to the strategy determined during construction.

Reference P&ID 60-I-120, 60-I-121, 60-I-123, 60-I-124, 60-I-125, 60-I-128

Frequency of Operation 1 Second

CONTROL STRATEGIES:

A. General Description

The sulfuric acid feed system and transfer pump system will be removed and no longer used. The Bulk Storage tanks will be setup for future connection. The tank discharge valves will be replaced and new limit switches will be provided with connection to the DCS for future use.

1. The Sulfuric Acid Bulk Storage and Handling System consists of two Bulk Storage Tanks

B. Related Equipment:

<u>Equipment</u>	<u>Equipment Number</u>
Fill Station	60PNL06
Sulfuric Acid Storage Tanks	60-T-61, 60-T-62
Tank Level Sensor	60LIT2400, 60LIT2405
Level Switches	60LSH2401, 60LSH2406, 60LSL2401 60LSL2406

C. Overview of Strategy:

1. The Bulk Storage Tank levels are monitored by the DCS along with both high and low level switches. **The level instrument connections to the DCS will be maintained for future use.**

2. The Bulk Storage Tank Levels and low and high level switches of each tank are monitored by the DCS.

3. DCS to monitor and Record the following:
 - a. Bulk Sulfuric Acid storage tank levels.
 - b. Open/Close status of Sulfuric Acid **tank discharge** valves.
 - c. Spill containment area high level **and high-high level** switch status.
 - d. Storage Tank high and low level switch status.

D. Computer Control Functions

1. Manual Control – **Not Used**

2. Automatic Control

- a. To keep a record of when each Storage Tank is filled, strategy will record the date and time at which a level transmitter in a tank begins to record an increase in level. At that time strategy will record the level at which the fill started and the level at which the fill stopped.
- b. During operation, an alarm will be indicated to the operator upon spill detection in the Storage Tank containment area.
- c. Process Interlocks
 - 1) Low level in operational Sulfuric Acid Storage Tank(s). Tank is operational if the suction line monitored hand valves are open.
 - 2) Tank is operational if the suction line monitored hand valves are open.
- I. Failure Responses - **Not Used**

E. Control System Intercommunication:

Process I/O

Process Inputs

- A. Analog: **No new analog inputs.**

- B. Discrete: **Containment level high-high alarm, 60LSHH2407**

Process Outputs

- A. Analog: **No new analog outputs.**

- B. Discrete: **No new discrete outputs.**

Alarms and Displays

Containment level high-high alarm.

END OF CONTROL STRATEGY

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CONTROL STRATEGY 42

SODIUM HYPOCHLORITE BULK STORAGE HANDLING SYSTEM

Section includes bold font text utilized to identify additions and revisions from original control strategies to be applied upon installation of improvements. City staff shall prepare programming modifications to the DCS based upon this section. Contractor shall coordinate with City staff for implementation of the programming modifications and determination of any potential revisions or deletions to the strategy determined during construction.

Reference P&ID 60-I-110

Frequency of Operation 1 Second

CONTROL STRATEGIES:

The existing control strategy will remain in place. A spill containment high-high level switch will be added to monitor for a spill containment alarm condition.

A. General Description

1. The Sodium Hypochlorite Bulk Storage and Handling System consists of two Bulk Storage Tanks, four Feed Pumps, and two Transfer Pumps.
2. The Feed Pumps will transfer Sodium Hypochlorite to the Main Odor Control System.
3. The Transfer Pumps will transfer Sodium Hypochlorite to Day Tanks at the Wastewater Pump Station.
4. The Sodium Hypochlorite Bulk Storage and Handling System can be automatically controlled by the DCS.
5. The Sodium Hypochlorite Bulk Storage and Handling System can be manually controlled by the operator via the DCS.

B. Related Equipment:

<u>Equipment</u>	<u>Equipment Number</u>
Fill Station	60PNL07
Sodium Hypochlorite Bulk Storage Tanks	60-T-51, 60-T-52
Sulfuric Acid Feed Pumps	60-P-51, 60-P-52, 60-P-53, 60-P-54
Sodium Hypochlorite Transfer Pumps	60-P-56, 60-P-57
Tank Level Sensor	60LIT2350, 60LIT2355

Level Switches

60LSH251, 60LSH2356, 60LSL2351
60LSL2356, **60LSHH2357**

C. Overview of Strategy:

1. The Sodium Hypochlorite is delivered by truck. The truck will pump Sodium Hypochlorite into the proper Sodium Hypochlorite Bulk Storage Tank and the fill station will indicate tank level and alarm on high level.
2. The Bulk Storage Tank levels are monitored by the DCS along with both high and low level switches.
3. Each Sodium Hypochlorite Feed Pump will Pump Sodium Hypochlorite to its respective Scrubber based on the pH signal as recommended by the Odor Control System Supplier.
4. Sodium Hypochlorite Feed Pump No. 4 has been designed as the Standby Feed Pump and will automatically replace any failed Feed Pump.
5. The Sodium Hypochlorite Transfer Pumps pumping program is designed as a one pump program with one pump standby with manual alternation as selected by the DCS operator. The Transfer Pump will start when it receives a low day tank level signal and will continue to pump until the high tank signal is received from the day tank to which the pump is pumping.
6. DCS to monitor and Record the following:
 - a. Bulk Sodium Hypochlorite storage tank levels.
 - b. Open/Close status of Sodium Hypochlorite system routing valves.
 - c. Feed Pumps ready, run, and hand switch status.
 - d. Transfer Pumps ready, run, and hand switch status.
 - e. Spill containment area high level **and high-high level** switch status.
 - f. Pump isolation valves thermal overload, fuse blown, torque, open/close and switch status.
 - g. Feed Pump No. 4 routing valve thermal overload, fuse blown, torque, open/close and hand switch status.
 - h. Storage Tank high and low level switch status.

D. Computer Control Functions

1. Manual Control

- a. Open/Close each motor operated Sodium Hypochlorite System routing valve.

Clicking on a valve accesses a controller faceplate that provides push buttons for Open/Close Manual control.

- b. Start/Stop each Sodium Hypochlorite Transfer Pump.

Clicking on a pump accesses a controller faceplate that provides push buttons for Start/Stop Manual control.

- c. Adjust speed of each Sodium Hypochlorite Feed Pump.

Clicking on a pump accesses a controller faceplate that provides a Raising/Lowering level meter for Adjust Speed Manual control.

2. Automatic Control

a. Feed Pumps

1. When Wet Scrubber No. 2 of an odor control train is placed IN SERVICE the related Sodium Hypochlorite Feed Pump and Sodium Hypochlorite Feed Pump No. 4 will be placed IN SERVICE.

2. Upon Initiation of Feed Pump control (see Main Odor Control Strategy), strategy will confirm status of all monitored hand valves between Sodium Hypochlorite Tanks and Feed Pumps. If at least one valve to a tank that is not at low level alarm is not open, strategy will indicate to operator.

3. During operation, strategy will Start/Stop the Scrubber's Sodium Hypochlorite feed pump to maintain the ph level set point (entered by the operator in the Odor Control Strategy) for that Scrubber. Pump speed (entered by the operator in the Odor Control Strategy) will be output to the pump VFD while the pump is IN SERVICE.

4. Automatic control of a feed pump will be inhibited while the associated Scrubber is OUT OF SERVICE.

5. During operation, if feed pump fails and if Feed Pump No. 4 is available, strategy will open pump No. 4 discharge routing valve to the discharge line of the failed pump and initiate control of pump No. 4 (control as failed pump was being controlled); upon confirmation, stop failed pump and alarm.

b. Transfer Pumps

Operator to select Sodium Hypochlorite Storage and Handling

Strategy (Graphic No. 2745). This strategy may be accessed by clicking on the "Control Strategy" Open Look Button on the Caustic Soda Block Diagram or Isometric graphic (2720& 2720).

- c. Operator to select lead pump. The other pump will become stand by.

The operator will select the "Lead" Open Look Button for either pump 1 or pump 2. The remaining pump will be designated as the standby.

- d. DCS to scan all I/O associated with the strategy and indicate ready or not ready.
- e. If ready, the "Start" Button may be pressed, initiating automatic pump control strategy which will:
 - 1) Confirm the status of all monitored hand valves between Sodium Hypochlorite Tanks and transfer pumps. If at least one valve from a tank not at low level is not open, strategy will indicate this to the operator.
 - 2) Upon low level alarm for a Sodium Hypochlorite Day Tank at the Wastewater Pump Station for which the inlet valve is open (Day Tank Strategy will open the inlet valve), start the lead Transfer Pump.
 - 3) Upon high level alarm for the day tank to which the Transfer Pump is pumping, stop the lead transfer pump.
 - 4) During operation if lead pump fails, standby will start; upon confirmation, lead will stop.
- f. To keep a record of when each Storage Tank is filled, strategy will record the date and time at which a level transmitter in a tank begins to record an increase in level. At that time strategy will record the level at which the fill started and the level at which the fill stopped.
- g. During operation, an alarm will be indicated to the operator upon spill detection in the Storage Tank containment area.
- h. Process Interlocks
 - 1) Stop Feed and Transfer Pumps if Low level in operational Sodium Hypochlorite Storage Tank(s). Tank is operational if the suction line monitored hand valves are open.
 - 2) Transfer Pump will stop upon leak detection in the day tanks containment structure.
 - 3) Stop Feed and Transfer Pumps if neither Storage Tank is operational. Tank is operational if the suction line monitored

hand valves are open.

I. Failure Responses:

- 1) Upon loss of communications with 94 PCMs, stop the transfer pumps if pumping to that area..

E. Control System Intercommunication:

- 1) Centrate/Wastewater Pump Station Chemical Feed System.
- 2) Main Odor Control System

Process I/O

Process Inputs

- A. Analog: **No new analog inputs.**

- B. Discrete: **Spill containment level high-high.**

Process Outputs

- A. Analog: **No new analog outputs.**

- B. Discrete: **No new discrete outputs.**

Alarms and Displays

Spill containment level high-high alarm.

END OF CONTROL STRATEGY

Legend:

New I/O		I/O to be removed		Tags are existing / new wiring required		Tags are Existing / wiring is existing	
HW - HARDWIRED	DL - DATA LINK	AI - ANALOG INPUT	AO - ANALOG OUTPUT	DI - DISCRETE INPUT	DO - DISCRETE OUTPUT		

Note: This form only list new I/O points, existing points that will be modified, and existing points that will be removed.

Drawing No.	Panel No.	Proposed			Drop / Controller No.	IO Type (AI/AO/DI/DO)	IO Connection (HW/DL)	Equipment Tag	Notes	Findings			
		Device Tag No	DCS Input	DCS Output									
60-I-10A	60PCM01	60LSHH2107	60LAHH2107		3	DI	HW	60-T-01 & 60-T-02	New spill area level switch	New I/O			
		60LSHH2108	60LAHH2108		3	DI	HW	60-T-01 & 60-T-02	New spill area level switch	New I/O			
		60HS1101	60ZD1101			3	DI	DL	60MV1101	BFV actuation extended	Tags are existing / new wiring required		
			60ZB1101			3	DI	DL					
				60HS1101A		3	DO	DL					
				60HS1101B		3	DO	DL					
			60Q11101			3	DI	DL					
			60TAH1101			3	DI	DL					
		60HS1102	60IAL1101			3	DI	DL	60MV1102	BFV actuation extended	Tags are existing / new wiring required		
			60ZD1102			3	DI	DL					
			60ZB1102			3	DI	DL					
				60HS1102A		3	DO	DL					
				60HS1102B		3	DO	DL					
			60Q11102			3	DI	DL					
		60HS1106	60TAH1102			3	DI	DL	60MV1106	BFV actuation extended	Tags are existing / new wiring required		
			60IAL1102			3	DI	DL					
			60ZD1106			3	DI	DL					
			60ZB1106			3	DI	DL					
				60HS1106A		3	DO	DL					
				60HS1106B		3	DO	DL					
		60HS1107	60Q11106			3	DI	DL	60MV1107	BFV actuation extended	Tags are existing / new wiring required		
			60TAH1106			3	DI	DL					
			60IAL1106			3	DI	DL					
			60ZD1107			3	DI	DL					
			60ZB1107			3	DI	DL					
				60HS1107A		3	DO	DL					
		60-I-11A	60PCM01	60HS1110			3	DI	DL	60MV1110	Ball valve	I/O to be removed	
							3	DI	DL				
						60HS1110A		3	DO				DL
						60HS1110B		3	DO				DL
					60Q11110			3	DI				DL
					60TAH1110			3	DI				DL
		60-I-11A	60PCM01	60HS1111	60IAL1110		3	DI	DL	60MV1111	Ball valve	I/O to be removed	
					60ZD1110			3	DI				DL
					60ZB1110			3	DI				DL
						60HS1111A		3	DO				DL
	60HS1111B					3	DO	DL					
60Q11111						3	DI	DL					
60HS0300	60TAH1111					3	DI	DL	60-PDD-01	Emulsion polymer dilution/dispersion Unit No. 1	I/O to be removed		
	60IAL1111					3	DI	DL					
	60HS0300			60HS0300		3	DO	HW					
	60Q0300			60Q0300		3	DI	HW					
	60SIC0300			60SC0300		3	DO	HW					
	60FSL0300			60FAL0300		3	DI	HW					
60PSL2110	60PAL2110		3	DI	HW	60PSL2110	Meter						
60PSH2110	60PAH2110		3	DI	HW	60PSH2110							

Drawing No.	Panel No.	Proposed		Drop / Controller No.	IO Type (AI/AO/DI/DO)	IO Connection (HW/DL)	Equipment Tag	Notes	Findings						
		Device Tag No	DCS Input							DCS Output					
60-I-12A	60PCM02	60HS1117	60ZD1117		4	DI	DL	60MV1117	BFV actuation removed	I/O to be removed					
			60ZB1117		4	DI	DL								
				60HS1117A	4	DO	DL								
				60HS1117B	4	DO	DL								
			60Q11117		4	DI	DL								
			60TAH1117		4	DI	DL								
		60IAL1117		4	DI	DL									
		60HS1118	60ZD1118		4	DI	DL								
			60ZB1118		4	DI	DL								
				60HS1118A	4	DO	DL								
				60HS1118B	4	DO	DL								
			60Q11118		4	DI	DL								
	60TAH1118			4	DI	DL									
	60PCM01	60HS1115	60ZD1115		3	DI	DL	60MV1115	BFV actuation removed	I/O to be removed					
			60ZB1115		3	DI	DL								
				60HS1115A	3	DO	DL								
				60HS1115B	3	DO	DL								
			60Q11115		3	DI	DL								
			60TAH1115		3	DI	DL								
		60HS1116	60ZD1116		3	DI	DL								
			60ZB1116		3	DI	DL								
				60HS1116A	3	DO	DL								
				60HS1116B	3	DO	DL								
			60Q11116		3	DI	DL								
			60TAH1116		3	DI	DL								
	60HS1112	60ZD1112		3	DI	DL									
		60ZB1112		3	DI	DL									
			60HS1112A	3	DO	DL									
			60HS1112B	3	DO	DL									
		60Q11112		3	DI	DL									
60TAH1112			3	DI	DL										
60-I-12A	60PCM01	60HS1113	60ZD1113		3	DI	DL	60MV1113	New actuated ball valve to replace existing I/O tags and new wiring	Tags are existing / new wiring required					
			60ZB1113		3	DI	DL								
				60HS1113A	3	DO	DL								
				60HS1113B	3	DO	DL								
			60Q11113		3	DI	DL								
			60TAH1113		3	DI	DL								
		60-I-20A	60PCM02	60HS1131	60IAL1131		3				DI	DL	60MV1131	New spill area level switch	New I/O
					60LHH2137	60LAHH2137	4				DI	HW			
					60LHH2138	60LAHH2138	4				DI	HW			
					60ZD1131		4				DI	DL			
					60ZB1131		4				DI	DL			
						60HS1131A	4				DO	DL			
60HS1132	60ZD1132			4	DI	DL									
	60ZB1132			4	DI	DL									
		60HS1132A		4	DO	DL									
		60HS1132B		4	DO	DL									
	60Q11132			4	DI	DL									
	60TAH1132			4	DI	DL									
60IAL1132		4	DI	DL											

Drawing No.	Panel No.	Proposed		Drop / Controller No.	IO Type (AI/AO/DI/DO)	IO Connection (HW/DL)	Equipment Tag	Notes	Findings		
		Device Tag No	DCS Input							DCS Output	
60-I-20A	60PCM02	60HS1136	60ZD1136		4	DI	DL	60MV1136	BFV actuation extended	Tags are existing / new wiring required	
			60ZB1136		4	DI	DL				
				60HS1136A	4	DO	DL				
				60HS1136B	4	DO	DL				
			60Q11136		4	DI	DL				
			60TAH1136		4	DI	DL				
		60IAL1136		4	DI	DL					
		60ZD1137		4	DI	DL	60MV1137		BFV actuation extended		
		60ZB1137		4	DI	DL					
			60HS1137A	4	DO	DL					
			60HS1137B	4	DO	DL					
		60Q11137		4	DI	DL					
		60TAH1137		4	DI	DL					
		60IAL1137		4	DI	DL					
60IAL1137		4	DI	DL							
60-I-21A	60PCM01	60LSHH2147	60LAHH2147		3	DI	HW	60-T-13 & 60-T-14	New spill area level switch	New I/O	
		60LSHH2148	60LAHH2148		3	DI	HW	60-T-13 & 60-T-14	New spill area level switch	New I/O	
		60HS1141	60ZD1141		3	DI	DL	60MV1141	BFV actuation extended	Tags are existing / new wiring required	
			60ZB1141		3	DI	DL				
				60HS1141A	3	DO	DL				
				60HS1141B	3	DO	DL				
			60Q11141		3	DI	DL				
			60TAH1141		3	DI	DL				
			60IAL1141		3	DI	DL				
			60IAL1141		3	DI	DL				
60-I-21A	60PCM01	60HS1142	60ZD1142		3	DI	DL	60MV1142	BFV actuation extended	Tags are existing / new wiring required	
			60ZB1142		3	DI	DL				
				60HS1142A	3	DO	DL				
				60HS1142B	3	DO	DL				
			60Q11142		3	DI	DL				
			60TAH1142		3	DI	DL				
			60IAL1142		3	DI	DL				
			60IAL1142		3	DI	DL				
		60HS1146	60ZD1146		3	DI	DL	60MV1146	BFV actuation extended		
			60ZB1146		3	DI	DL				
				60HS1146A	3	DO	DL				
				60HS1146B	3	DO	DL				
			60Q11146		3	DI	DL				
			60TAH1146		3	DI	DL				
			60IAL1146		3	DI	DL				
			60IAL1146		3	DI	DL				
		60HS1147	60ZD1147		3	DI	DL	60MV1147	BFV actuation extended		Tags are existing / new wiring required
			60ZB1147		3	DI	DL				
				60HS1147A	3	DO	DL				
				60HS1147B	3	DO	DL				
60Q11147			3	DI	DL						
60TAH1147			3	DI	DL						
60IAL1147			3	DI	DL						
60IAL1147			3	DI	DL						
60-I-22A	60PCM02	60HS1150	60ZD1150		4	DI	DL	60MV1150	Ball valve	I/O to be removed	
			60ZB1150		4	DI	DL				
				60HS1150A	4	DO	DL				
				60HS1150B	4	DO	DL				
			60Q11150		4	DI	DL				
			60TAH1150		4	DI	DL				
			60IAL1150		4	DI	DL				
			60IAL1150		4	DI	DL				

Drawing No.	Panel No.	Proposed			Drop / Controller No.	IO Type (AI/AO/DI/DO)	IO Connection (HW/DL)	Equipment Tag	Notes	Findings		
		Device Tag No	DCS Input	DCS Output								
60-I-22A	60PCM02	60HS0301		60HS0301	4	DO	HW	60-PDD-02	Emulsion polymer dilution/dispersion Unit No. 2	I/O to be removed		
		60QS0301	60QI0301		4	DI	HW					
		60SIC0301		60SC0301	4	AO	HW					
		60FSL0301	60FAL0301		4	DI	HW	60PSL2150	Meter			
		60PSL2150	60PAL2150		4	DI	HW					
		60PSH2150	60PAH2150		4	DI	HW					
		60HS0302		60HS0302	4	DO	HW	60-PDD-03	Emulsion polymer dilution/dispersion Unit No. 3			
		60QS0302	60QI0302		4	DI	HW					
		60SIC0302		60SC0302	4	AO	HW					
		60FSL0302	60FAL0302		4	DI	HW	60PSL2150	Meter			
		60PSL2150	60PAL2151		4	DI	HW					
		60PSH2150	60PAH2151		4	DI	HW					
		60HS1151	60PCM02	60ZD1151			4	DI	DL		60MV1151	Ball valve
				60ZB1151			4	DI	DL			
						60HS1151A	4	DO	DL			
						60HS1151B	4	DO	DL			
				60Q11151			4	DI	DL			
				60TAH1151			4	DI	DL			
60IAL1151					4	DI	DL					
60ZD1155					4	DI	DL	60MV1155	BFV actuation removed			
60ZB1155					4	DI	DL					
				60HS1155A	4	DO	DL					
		60HS1155B	4	DO	DL							
60Q11155			4	DI	DL							
60HS1157	60PCM02	60TAH1155			4	DI	DL	60MV1157	BFV actuation removed			
		60IAL1155			4	DI	DL					
		60ZD1157			4	DI	DL					
		60ZB1157			4	DI	DL					
				60HS1157A	4	DO	DL					
				60HS1157B	4	DO	DL					
		60Q11157			4	DI	DL					
		60TAH1157			4	DI	DL					
		60IAL1157			4	DI	DL					
		60ZD1156			4	DI	DL			60MV1156	New actuated ball valve to replace existing in new location using existing I/O tags and new wiring	
60ZB1156			4	DI	DL							
		60HS1156A	4	DO	DL							
		60HS1156B	4	DO	DL							
60Q11156			4	DI	DL							
60HS1158	60PCM02	60TAH1156			4	DI	DL	60MV1158	New actuated ball valve to replace existing in new location using existing I/O tags and new wiring			
		60IAL1156			4	DI	DL					
		60ZD1158			4	DI	DL					
		60ZB1158			4	DI	DL					
				60HS1158A	4	DO	DL					
				60HS1158B	4	DO	DL					
60HS1152	60PCM02	60Q11158			4	DI	DL	60MV1152	New actuated ball valve to replace existing in new location using existing I/O tags and new wiring			
		60TAH1158			4	DI	DL					
		60IAL1158			4	DI	DL					
		60ZD1152			4	DI	DL					
		60ZB1152			4	DI	DL					
				60HS1152A	4	DO	DL					
		60HS1152B	4	DO	DL							
60Q11152			4	DI	DL	60MV1152	New actuated ball valve to replace existing in new location using existing I/O tags and new wiring					
60TAH1152			4	DI	DL							
60IAL1152			4	DI	DL							

Drawing No.	Panel No.	Proposed		Drop / Controller No.	IO Type (AI/AO/DI/DO)	IO Connection (HW/DL)	Equipment Tag	Notes	Findings
		Device Tag No	DCS Input						
60-I-23A	60PCM02	60HS1153	60ZD1153		4	DI	60MV1153	New actuated ball valve to replace existing in new location using existing I/O tags and new wiring	Tags are existing / new wiring required
			60ZB1153		4	DI			
				60HS1153A	4	DO			
				60HS1153B	4	DO			
			60Q11153		4	DI			
			60TAH1153		4	DI			
60I-31A	60PCM01	60LSHW2169	60LAHH2169		3	DI	60-T-21	New spill area level switch	New I/O
60-I-37A	60PCM03	60HS1204	60ZD1204		5	DI	60MV1204	New actuated ball valve to replace existing in same location using existing I/O and wiring	Tags are existing / wiring is existing
			60ZB1204		5	DI			
				60HS1204A	5	DO			
				60HS1204R	5	DO			
			60Q11204		5	DI			
			60TAH1204		5	DI			
60-I-38A	60PCM04	60MS0211	60MI0211		5	DI	60-P-11	Replacing polymer pump with larger size pump	Tags are existing / wiring is existing
			60RS0211		5	DI			
			60QS0211	60QI0211	5	DI			
			60HS0211	60HS0211	5	DO			
			60PSL2210B	60PAL2210B	5	DI			
			60PSH2210	60PAH2210	5	DI			
60-I-38A	60PCM04	60HS1211	60ZD1211		5	DI	60MV1211	New actuated ball valve to replace existing in same location using existing I/O and wiring	Tags are existing / wiring is existing
			60ZB1211		5	DI			
				60HS1211A	5	DO			
				60HS1211B	5	DO			
			60Q1211		5	DI			
			60TAH1211		5	DI			
60-I-100A	60PCM03	60LSHH2307	60LAHH2307		5	DI	60-T-41 & 60-T-42	New spill area level switch	New I/O
			60ZSD1300	60ZD1300	5	DI	60HV1300	Diaphragm valve limit switch extended	Tags are existing / new wiring required
			60ZSB1300	60ZB1300	5	DI	60HV1301	Diaphragm valve limit switch extended	Tags are existing / new wiring required
			60ZSD1301	60ZD1301	5	DI			
			60ZSB1301	60ZB1301	5	DI	60HV1305	Diaphragm valve limit switch extended	Tags are existing / new wiring required
			60ZSD1305	60ZD1305	5	DI			
			60ZSB1305	60ZB1305	5	DI	60HV1306	Diaphragm valve limit switch extended	Tags are existing / new wiring required
			60ZSD1306	60ZD1306	5	DI			
			60ZSB1306	60ZB1306	5	DI			
			60-I-110A	60PCM04	60LSHH2357	60LAHH2357		6	DI
60ZSD1350	60ZD1350	6				DI	60HV1350	Diaphragm valve limit switch extended	Tags are existing / new wiring required
60ZSB1350	60ZB1350	6				DI	60HV1351	Diaphragm valve limit switch extended	Tags are existing / new wiring required
60ZSD1351	60ZD1351	6				DI			
60ZSB1351	60ZB1351	6				DI	60HV1355	Diaphragm valve limit switch extended	Tags are existing / new wiring required
60ZSD1355	60ZD1355	6				DI			
60ZSB1355	60ZB1355	6				DI	60HV1356	Diaphragm valve limit switch extended	Tags are existing / new wiring required
60ZSD1356	60ZD1356	6				DI			
60ZSB1356	60ZB1356	6				DI			
60-I-120A	60PCM04	60LSHH2407	60LAHH2407		6	DI	60-T-61 & 60-T-62	New spill area level switch	New I/O
			60ZSD1400	60ZD1400	6	DI	60HV1400	New ball valve to replace existing diaphragm valve in new location using existing I/O tags and new wiring	Tags are existing / new wiring required
			60ZSB1400	60ZB1400	6	DI			

Drawing No.	Panel No.	Proposed			Drop / Controller No.	IO Type (AI/AO/DI/DO)	IO Connection (HW/DL)	Equipment Tag	Notes	Findings
		Device Tag No	DCS Input	DCS Output						
60-I-120A	60PCM04	60ZSD1401	60ZD1401		6	DI	HW	60HV1401	New ball valve to replace existing diaphragm valve in new location using existing I/O tags and new wiring	Tags are existing / new wiring required
		60ZSB1401	60ZB1401		6	DI	HW			
		60ZSD1405	60ZD1405		6	DI	HW	60HV1405	New ball valve to replace existing diaphragm valve in new location using existing I/O tags and new wiring	Tags are existing / new wiring required
		60ZSB1405	60ZB1405		6	DI	HW			
		60ZSD1406	60ZD1406		6	DI	HW	60HV1406	New ball valve to replace existing diaphragm valve in new location using existing I/O tags and new wiring	Tags are existing / new wiring required
		60ZSB1406	60ZB1406		6	DI	HW			
60-I-130A	60PCM04	60LSHH2457	60LAHH2457		5	DI	HW	60-T-81 & 60-T-82	New spill area level switch	New I/O
		60ZSD1451	60ZD1451		6	DI	HW	60HV1451	New ball valve to replace existing diaphragm valve in new location using existing I/O tags and new wiring	Tags are existing / new wiring required
		60ZSB1451	60ZB1451		6	DI	HW			
		60ZSD1456	60ZD1456		6	DI	HW	60HV1456	New ball valve to replace existing diaphragm valve in new location using existing I/O tags and new wiring	Tags are existing / new wiring required
		60ZSB1456	60ZB1456		6	DI	HW			
		60ZSD1450	60ZD1450		6	DI	HW	60HV1450	New ball valve to replace existing diaphragm valve in new location using existing I/O tags and new wiring	Tags are existing / new wiring required
		60ZSB1450	60ZB1450		6	DI	HW			
		60ZSD1452	60ZD1452		6	DI	HW	60HV1452	New ball valve to replace existing diaphragm valve in new location using existing I/O tags and new wiring	Tags are existing / new wiring required
		60ZSB1452	60ZB1452		6	DI	HW			
		60ZSD1455	60ZD1455		6	DI	HW	60HV1455	New ball valve to replace existing diaphragm valve in new location using existing I/O tags and new wiring	Tags are existing / new wiring required
		60ZSB1455	60ZB1455		6	DI	HW			
		60ZSD1457	60ZD1457		6	DI	HW	60HV1457	New ball valve to replace existing diaphragm valve in new location using existing I/O tags and new wiring	Tags are existing / new wiring required
		60ZSB1457	60ZB1457		6	DI	HW			
60-I-130A	60PCM04	60HS1470	60ZD1470		6	DI	DL	60MV1470	New actuated ball valve to replace existing diaphragm valve in new location using existing I/O tags and new wiring	Tags are existing / new wiring required
			60ZB1470		6	DI	DL			
				60HS1470A	6	DO	DL			
				60HS1470B	6	DO	DL			
			60QI1470		6	DI	DL			
			60TAH1470		6	DI	DL			
		60HS1471	60ZD1471		6	DI	DL	60MV1471	New actuated ball valve to replace existing diaphragm valve in new location using existing I/O tags and new wiring	Tags are existing / new wiring required
			60ZB1471		6	DI	DL			
				60HS1471A	6	DO	DL			
				60HS1471B	6	DO	DL			
			60QI1471		6	DI	DL			
			60TAH1471		6	DI	DL			
			60IAL1471		6	DI	DL			
			60IAL1471		6	DI	DL			

Drawing No.	Panel No.	Proposed			Drop / Controller No.	IO Type (AI/AO/DI/DO)	IO Connection (HW/DL)	Equipment Tag	Notes	Findings
		Device Tag No	DCS Input	DCS Output						
60-I-131A	60PCM03	60HS1460	60ZD1460		5	DI	DL	60MV1460	New actuated ball valve to replace existing diaphragm valve in new location using existing I/O tags and new wiring	Tags are existing / new wiring required
			60ZB1460		5	DI	DL			
				60HS1460A	5	DO	DL			
				60HS1460B	5	DO	DL			
			60QI1460		5	DI	DL			
			60TAH1460		5	DI	DL			
		60IAL1460		5	DI	DL				
		60ZD1461		5	DI	DL	60MV1461	New actuated ball valve to replace existing diaphragm valve in new location using existing I/O tags and new wiring	Tags are existing / new wiring required	
		60ZB1461		5	DI	DL				
			60HS1461A	5	DO	DL				
			60HS1461B	5	DO	DL				
		60QI1461		5	DI	DL				
	60TAH1461		5	DI	DL					
	60IAL1461		5	DI	DL					
	60ZD1465		6	DI	DL	60MV1465	New actuated ball valve to replace existing diaphragm valve in new location using existing I/O tags and new wiring	Tags are existing / new wiring required		
	60ZB1465		6	DI	DL					
		60HS1465A	6	DO	DL					
		60HS1465B	6	DO	DL					
	60QI1465		6	DI	DL					
	60TAH1465		6	DI	DL					
	60IAL1465		6	DI	DL					
	60ZD1466		6	DI	DL	60MV1466	New actuated ball valve to replace existing diaphragm valve in new location using existing I/O tags and new wiring	Tags are existing / new wiring required		
	60ZB1466		6	DI	DL					
		60HS1466A	6	DO	DL					
	60HS1466B	6	DO	DL						
60QI1466		6	DI	DL						
60TAH1466		6	DI	DL						
60IAL1466		6	DI	DL						
60-I-135A	60PCM04	60LSHH2487	60LAHH2487		6	DI	HW	60-T-71 & 60-T-72	New spill area level switch	New I/O
		60ZSD1481	60ZD1481		6	DI	HW	60HV1481	New ball valve to replace existing diaphragm valve in new location using existing I/O tags and new wiring	Tags are existing / new wiring required
		60ZSB1481	60ZB1481		6	DI	HW			
		60ZSD1486	60ZD1486		6	DI	HW	60HV1486	New ball valve to replace existing diaphragm valve in new location using existing I/O tags and new wiring	Tags are existing / new wiring required
		60ZSB1486	60ZB1486		6	DI	HW			
		60ZSD1480	60ZD1480		6	DI	HW	60HV1480	Extend diaphragm valve limit switch controller up above grate	Tags are existing / new wiring required
		60ZSB1480	60ZB1480		6	DI	HW			
		60ZSD1482	60ZD1482		6	DI	HW	60HV1482	Extend diaphragm valve limit switch controller up above grate	Tags are existing / new wiring required
		60ZSB1482	60ZB1482		6	DI	HW			
		60ZSD1485	60ZD1485		6	DI	HW	60HV1485	Extend diaphragm valve limit switch controller up above grate	Tags are existing / new wiring required
		60ZSB1485	60ZB1485		6	DI	HW			
		60ZSD1487	60ZD1487		6	DI	HW	60HV1487	Extend diaphragm valve limit switch controller up above grate	Tags are existing / new wiring required
		60ZSB1487	60ZB1487		6	DI	HW			

Drawing No.	Panel No.	Proposed			Drop / Controller No.	IO Type (AI/AO/DI/DO)	IO Connection (HW/DL)	Equipment Tag	Notes	Findings
		Device Tag No	DCS Input	DCS Output						
60-I-135A	60PCM04	60HS1500	60ZD1500		6	DI	DL	60MV1500	New actuated ball valve to replace existing diaphragm valve in new location using existing I/O tags and new wiring	Tags are existing / new wiring required
			60ZB1500		6	DI	DL			
				60HS1500A	6	DO	DL			
				60HS1500B	6	DO	DL			
			60QI1500		6	DI	DL			
			60TAH1500		6	DI	DL			
		60IAL1500		6	DI	DL				
		60HS1501	60ZD1501		6	DI	DL			
			60ZB1501		6	DI	DL			
				60HS1501A	6	DO	DL			
				60HS1501B	6	DO	DL			
			60QI1501		6	DI	DL			
			60TAH1501		6	DI	DL			
			60IAL1501		6	DI	DL			
60ZD1490			5	DI	DL					
60-I-136A	60PCM03	60HS1490	60ZB1490		5	DI	DL	60MV1490	New actuated ball valve to replace existing diaphragm valve in new location using existing I/O tags and new wiring	Tags are existing / new wiring required
				60HS1490A	5	DO	DL			
				60HS1490B	5	DO	DL			
			60QI1490		5	DI	DL			
			60TAH1490		5	DI	DL			
			60IAL1490		5	DI	DL			
		60HS1491	60ZD1491		5	DI	DL			
			60ZB1491		5	DI	DL			
				60HS1491A	5	DO	DL			
				60HS1491B	5	DO	DL			
			60QI1491		5	DI	DL			
			60TAH1491		5	DI	DL			
			60IAL1491		5	DI	DL			
			60ZD1495		6	DI	DL			
60-I-136A	60PCM04	60HS1495	60ZB1495		6	DI	DL	60MV1495	New actuated ball valve to replace existing diaphragm valve in new location using existing I/O tags and new wiring	Tags are existing / new wiring required
				60HS1495A	6	DO	DL			
				60HS1495B	6	DO	DL			
			60QI1495		6	DI	DL			
			60TAH1495		6	DI	DL			
			60IAL1495		6	DI	DL			
		60HS1496	60ZD1496		6	DI	DL			
			60ZB1496		6	DI	DL			
				60HS1496A	6	DO	DL			
				60HS1496B	6	DO	DL			
			60QI1496		6	DI	DL			
			60TAH1496		6	DI	DL			
			60IAL1496		6	DI	DL			
			60ZD1820		16	DI	DL			
76-I-250A	76PCM06	76HS1820	76ZB1820		16	DI	DL	76-MV-1820	Diaphragm valve	I/O to be removed
				76HS1820A	16	DO	DL			
				76HS1820B	16	DO	DL			
			76QI1820		16	DI	DL			
			76TAH1820		16	DI	DL			
			76IAL1820		16	DI	DL			

Drawing No.	Panel No.	Proposed			Drop / Controller No.	IO Type (AI/AO/DI/DO)	IO Connection (HW/DL)	Equipment Tag	Notes	Findings		
		Device Tag No	DCS Input	DCS Output								
76-I-250A	76PCM06	76HS1821	76ZD1821		16	DI	DL	76-MV-1821	Diaphragm valve	I/O to be removed		
			76ZB1821		16	DI	DL					
				76HS1821A	16	DO	DL					
				76HS1821B	16	DO	DL					
			76QI1821		16	DI	DL					
			76TAH1821		16	DI	DL					
			76IAL1821		16	DI	DL					
			76ZD1825		17	DI	DL					
	76PCM07	76HS1825	76HS1825	76ZB1825		17	DI	DL	76-MV-1825	Diaphragm valve	I/O to be removed	
					76HS1825A	17	DO	DL				
					76HS1825B	17	DO	DL				
				76QI1825		17	DI	DL				
				76TAH1825		17	DI	DL				
				76IAL1825		17	DI	DL				
				76ZD1826		17	DI	DL				
				76ZB1826		17	DI	DL				
		76HS1826	76HS1826	76HS1826		76HS1826A	17	DO	DL	76-MV-1826	Diaphragm valve	I/O to be removed
						76HS1826B	17	DO	DL			
					76QI1826		17	DI	DL			
					76TAH1826		17	DI	DL			
					76IAL1826		17	DI	DL			
					80ZD1714		38	DI	DL			
					80ZB1714		38	DI	DL			
						80HS1714A	38	DO	DL			
80-I-200	80PCM05	80HS1714		80HS1714B	38	DO	DL	80MV1714	Actuated diaphragm valve	I/O to be removed		
			80QI1714		38	DI	DL					
			80TAH1714		38	DI	DL					
			80NT1714		38	AI	DL					
			80IAL1714		38	DI	DL					
			80ZD1712		38	DI	DL					
			80ZB1712		38	DI	DL					
				80HS1712A	38	DO	DL					
				80HS1712B	38	DO	DL					
			80QI1712		38	DI	DL					
			80TAH1712		38	DI	DL					
			80NT1712		38	AO	DL					
80-I-201	80PCM05	80HS1712	80IAL1712		38	DI	DL	80MV1712	Actuated diaphragm valve	I/O to be removed		
			80ZD1712		38	DI	DL					
			80ZB1712		38	DI	DL					
				80HS1712A	38	DO	DL					
				80HS1712B	38	DO	DL					
			80QI1712		38	DI	DL					
			80TAH1712		38	DI	DL					
			80NT1712		38	AO	DL					
		80IAL1712		38	DI	DL						
		80HS1717	80HS1717	80HS1717	80ZD1717		38	DI	DL	80MV1717	Actuated diaphragm valve	I/O to be removed
					80ZB1717		38	DI	DL			
						80HS1717A	38	DO	DL			
						80HS1717B	38	DO	DL			
					80QI1717		38	DI	DL			
					80TAH1717		38	DI	DL			
					80NT1717		38	AO	DL			
80IAL1717					38	DI	DL					
80ZSD1713	80ZD1713		38	DI	HW	80HV1713	Diaphragm valve	I/O to be removed				
80ZSB1713	80ZB1713		38	DI	HW							
80ZSD1718	80ZD1718		38	DI	HW	80HV1718	Diaphragm valve	I/O to be removed				
80ZSB1718	80ZB1718		38	DI	HW							

Drawing No.	Panel No.	Proposed			Drop / Controller No.	IO Type (AI/AO/DI/DO)	IO Connection (HW/DL)	Equipment Tag	Notes	Findings	
		Device Tag No	DCS Input	DCS Output							
80-I-205A	80PCMO5	80FIT2725	80FT2725 (0-5 GPM)		38	AI	HW	80FE2725	Replace meter in new location	Tags are existing / new wiring required	
		60HS1725	60ZD1725			38	DI	DL	60MV1725	New actuated ball valve to replace existing diaphragm valve in new location using existing I/O tags and new wiring	Tags are existing / new wiring required
			60ZB1725			38	DI	DL			
				60HS1725A		38	DO	DL			
				60HS1725B		38	DO	DL			
			60QI1725			38	DI	DL			
			60TAH1725			38	DI	DL			
			60IAL1725			38	DI	DL			
80-I-205A	80PCMO5	60HS1726	60ZD1726			38	DI	DL	60MV1726	New actuated ball valve to replace existing diaphragm valve in new location using existing I/O tags and new wiring	Tags are existing / new wiring required
			60ZB1726			38	DI	DL			
				60HS1726A		38	DO	DL			
				60HS1726B		38	DO	DL			
			60QI1726			38	DI	DL			
			60TAH1726			38	DI	DL			
			60IAL1726			38	DI	DL			
			80-I-206A	80PCMO1	80FIT2730	80FT2730 (0-5 GPM)		32			
60HS1730	60ZD1730					9	DI	DL	60MV1730	New actuated ball valve to replace existing diaphragm valve in new location using existing I/O tags and new wiring	Tags are existing / new wiring required
	60ZB1730					9	DI	DL			
		60HS1730A				9	DO	DL			
		60HS1730B				9	DO	DL			
	60QI1730					9	DI	DL			
	60TAH1730					9	DI	DL			
	60IAL1730					9	DI	DL			
60HS1731	60ZD1731					9	DI	DL	60MV1731	New actuated ball valve to replace existing diaphragm valve in new location using existing I/O tags and new wiring	Tags are existing / new wiring required
	60ZB1731					9	DI	DL			
		60HS1731A				9	DO	DL			
		60HS1731B				9	DO	DL			
	60QI1731					9	DI	DL			
	60TAH1731					9	DI	DL			
	60IAL1731			9	DI	DL					
80-I-207A	80PCMO2B	80FIT2735	80FT2735 (0-5 GPM)		34	AI	HW	80FE2735	Replace meter in new location	Tags are existing / new wiring required	
		60HS1735	60ZD1735			34	DI	DL	60MV1735	New actuated ball valve to replace existing diaphragm valve in new location using existing I/O tags and new wiring	Tags are existing / new wiring required
			60ZB1735			34	DI	DL			
				60HS1735A		34	DO	DL			
				60HS1735B		34	DO	DL			
			60QI1735			34	DI	DL			
			60TAH1735			34	DI	DL			
			60IAL1735			34	DI	DL			
		80MS0182	80MI0182		34	DI	HW	80-P-82	Ferrous chloride feed pump No. 3	Tags are existing / new wiring required	
		80ST0182	80ST0182 (0-100%)		34	AI	HW				
		80RS0182	80RI0182		34	DI	HW				
		80US0182	80UA0182		34	DI	HW				
		80QS0182	80QI0182		34	DI	HW				
		80HS0182	80HS0182		34	DO	HW				
80SIC0182	80SC0182		34	AO	HW						

Drawing No.	Panel No.	Proposed			Drop / Controller No.	IO Type (AI/AO/DI/DO)	IO Connection (HW/DL)	Equipment Tag	Notes	Findings		
		Device Tag No	DCS Input	DCS Output								
80-I-207A	80PCM02B	60HS1736	60ZD1736		34	DI	DL	60MV1736	New actuated ball valve to replace existing diaphragm valve in new location using existing I/O tags and new wiring	Tags are existing / new wiring required		
			60ZB1736		34	DI	DL					
				60HS1736A	34	DO	DL					
				60HS1736B	34	DO	DL					
			60QI1736		34	DI	DL					
			60TAH1736		34	DI	DL					
			60IAL1736		34	DI	DL					
80-I-208A	80PCM03B	80HS1740	80ZD1740		36	DI	DL	80-MV-1740	Diaphragm valve	I/O to be removed.		
			80ZB1740		36	DI	DL					
				80HS1740A	36	DO	DL					
				80HS1740B	36	DO	DL					
			80QI1740		36	DI	DL					
			80TAH1740		36	DI	DL					
			80NT1740		36	DI	DL					
		80IAL1740		36	DI	DL						
		80MS0183	80MI0183		36	DI	HW	80-P-83	Ferrous chloride feed pump No. 4			
		80ST0183	80ST0183 (0-100%)		36	AI	HW					
		80RS0183	80RI0183		36	DI	HW					
		80US0183	80UA0183		36	DI	HW					
		80QS0183	80QI0183		36	DI	HW	80-FE-2740	Flow meter			
		80HS0183		80HS0183	36	DO	HW					
		80SC0183		80SC0183	36	AO	HW					
		80FIT2740	80FT2740 (0-5 GPM)		36	AI	HW					
		80HS1741			80ZD1741		36	DI	DL		80-MV-1741	Diaphragm valve
					80ZB1741		36	DI	DL			
						80HS1741A	36	DO	DL			
						80HS1741B	36	DO	DL			
					80QI1741		36	DI	DL			
					80TAH1741		36	DI	DL			
					80NT1741		36	DI	DL			
		80IAL1741		36	DI	DL						
		80HS1744			80ZD1744		36	DI	DL		80-MV-1744	Diaphragm valve
					80ZB1744		36	DI	DL			
						80HS1744A	36	DO	DL			
	80HS1744B				36	DO	DL					
80QI1744					36	DI	DL					
80TAH1744					36	DI	DL					
80NT1744					36	DI	DL					
80IAL1744		36	DI	DL								

Drawing No.	Panel No.	Proposed			Drop / Controller No.	IO Type (AI/AO/DI/DO)	IO Connection (HW/DL)	Equipment Tag	Notes	Findings	
		Device Tag No	DCS Input	DCS Output							
80-I-209A	80PCM03B	80HS1740	80ZD1740		36	DI	DL	80-MV-1740	Diaphragm valve	I/O to be removed	
			80ZB1740		36	DI	DL				
				80HS1740A	36	DO	DL				
				80HS1740B	36	DO	DL				
			80QI1740		36	DI	DL				
			80TAH1740		36	DI	DL				
			80NT1740		36	DI	DL				
			80IAL1740		36	DI	DL				
		80MS0184	80MI0184		36	DI	HW	80-P-84	Ferrous chloride feed pump No. 5		
		80ST0184	80ST0184 (0-100%)		36	AI	HW				
		80RS0184	80RI0184		36	DI	HW				
		80US0184	80UA0184		36	DI	HW				
		80QS0184	80QI0184		36	DI	HW				
		80HS0184		80HS0184	36	DO	HW				
		80SIC0184		80SC0184	36	AO	HW				
		80FT2745	80FT2745 (0-5 GPM)		36	AI	HW				80-FE-2745
		80HS1746	80HS1746	80ZD1746		36	DI	DL	80-MV-1746		Diaphragm valve
				80ZB1746		36	DI	DL			
					80HS1746A	36	DO	DL			
					80HS1746B	36	DO	DL			
				80QI1746		36	DI	DL			
				80TAH1746		36	DI	DL			
				80NT1746		36	DI	DL			
				80IAL1746		36	DI	DL			
		80HS0049	80HS0049	80ZD0049		36	DI	DL	80-MV-0049		Diaphragm valve
				80ZB0049		36	DI	DL			
					80HS0049A	36	DO	DL			
					80HS0049B	36	DO	DL			
				80QI0049		36	DI	DL			
				80TAH0049		36	DI	DL			
80NT0049				36	DI	DL					
80IAL0049				36	DI	DL					

Section 15020

MISCELLANEOUS PIPING AND ACCESSORIES INSTALLATION

PART 1 - GENERAL

1-1. SCOPE. This section covers the installation of piping and accessories as indicated on the Drawings for the following piping sections:

Section Title

Miscellaneous Plastic Pipe

Contractor shall furnish all necessary jointing materials, coatings, and accessories that are specified herein.

Pipe supports and anchors shall be furnished by Contractor, and are covered in the Pipe Supports section.

1-2. GENERAL.

1-2.01. 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 Engineer.

1-3. SUBMITTALS.

1-3.01. Drawings and Data. Complete specifications, data, and catalog cuts or drawings shall be submitted in accordance with the Greenbook and Whitebook Submittals section. Items requiring submittals shall include, but not be limited to, the following:

Materials as specified herein.

1-3.02. Welder Certification. Not Used.

1-3.03. Spool Drawings. Not Used.

1-4. QUALITY ASSURANCE.

1-4.01. Welding and Brazing Qualifications. Not Used.

1-4.02. Tolerances. These tolerances apply to in-line items and connections for other lines.

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 .

The inclination of flange face from true in any direction shall not exceed 3/64 inch per foot .

Rotation of flange bolt holes shall not exceed 1/16 inch .

1-5. DELIVERY, STORAGE, AND HANDLING. Shipping shall be in accordance with the Product Delivery Requirements section. Handling and storage shall be in accordance with the Product Storage and Handling Requirements section. All materials shall be stored in a sheltered location above the ground, separated by type, and shall be supported to prevent sagging or bending.

Plastic pipe, tubing, and fittings shall be stored between 40°F and 90°F .

PART 2 - PRODUCTS

2-1. SERVICE CONDITIONS. Pipe, tubing, and fittings covered herein shall be installed in the services indicated in the various pipe sections.

2-2. MATERIALS.

Threaded Fittings

Anti-Seize Thread Lubricant	Jet-Lube "Nikal", John Crane "Thred Gard Nickel", Never-Seez "Pure Nickel Special", or Permatex "Nickel Anti-Seize".
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Teflon Thread Sealer	Paste type; Hercules "Real-tuff", John Crane "JC-30", or Permatex "Thread Sealant with Teflon".
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Teflon Thread Tape	Hercules "Tape Dope" or John Crane "Thread-Tape".
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Solvent Welded Fittings

Solvent cement for PVC Systems	ASTM D2564.
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Solvent cement for CPVC Systems	ASTM F493.
Sodium Hypochlorite, Sodium Hydroxide, and Sodium Bisulfite Service	IPS Corporation "Weld-On 724"
Primer for PVC Systems	ASTM F656.
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.

PART 3 - EXECUTION

3-1. INSPECTION. 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 the Engineer before its use.

3-2. PREPARATION.

3-2.01. 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.

3-3. INSTALLATION.

3-3.01. 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.

3-3.02. 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. Pipe sleeves installed through floors with a special

finish, such as ceramic or vinyl composition tile, shall be flush with the finished floor surface and shall be provided with nickel or chromium plated floor plates. Unless otherwise indicated on the Drawings, in all other 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.

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.

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.

Piping 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, when passing through the following locations:

Area 60 Tank Farm Containment Basins

Area 60 and 80 Building Walls

3-3.03. Pipe Joints. Pipe joints shall be carefully and neatly made in accordance with the indicated requirements.

Where solvent joints occur, curing times (per the manufacturer recommendations) shall be taken into account in the development of the Contractor improvement schedules. If the Contractor's proposed installation schedule results in a conflict between the allowable shutdown period and the joint solvent cure time, the Contractor at their own expense will be responsible for providing alternative assembly methods that do not require joint solvent. All efforts shall be made to limit the location of alternative assembly methods, and shall be submitted by the Contractor and approved by the Engineer prior to installation.

3-3.03.01. 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.

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.

3-3.03.02. Compression. Not Used.

3-3.03.03. Flared. Not Used.

3-3.03.04. Soldered and Brazed. Not Used.

3-3.03.05. Solvent Welded. Solvent welded connections shall only be used for PVC or CPVC pipe. All joint preparation, cutting, and jointing procedures shall comply with the pipe manufacturer's recommendations and ASTM D2855. Pipe ends shall be beveled or chamfered to the dimensions recommended by the manufacturer. Newly assembled joints shall be suitably blocked or restrained to prevent movement during the setting time recommended by the manufacturer. Pressure testing of solvent welded piping systems shall not be performed until the applicable curing time, as set forth in Table X2.1 of ASTM D2855, has elapsed. Solvent welding shall be performed by bonding operators who have met the requirements of ASME B31.3 and A328.

3-3.03.06. Epoxy and Adhesive Bonded. Not Used.

3-3.03.07. Heat Fusion Bonded. Not Used.

3-3.03.08. 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.

Flange bolt holes shall be oriented as follows, unless otherwise indicated on the spool drawings:

Vertical flange face:	Bolt holes to straddle the vertical centerlines.
Horizontal flange face:	Bolt holes shall be aligned with connecting pipe.

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 Engineer.

Welds at orifice flanges shall have internal surfaces ground smooth to the pipe wall.

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.

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.

Weld neck flanges shall be used with butt-weld fittings. The bore of weld neck flanges shall match the pipe wall thickness.

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.

3-3.03.09. Welded. Welding shall conform to the specifications and recommendations contained in the "Code for Pressure Piping", ANSI B31.1.

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 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 Engineer.

For socket weld joints, fully engage the two pipe ends, then separate them by 1/16 inch prior to welding to all space for shrinkage.

3-3.03.10. Grooved Couplings. Not Used.

3-3.03.11. Push-on. Not Used.

3-3.03.12. Rubber-Gasketed. Not Used.

3-3.03.13. Other Pipe Joints. Not Used.

3-3.04. 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 Engineer.

Piping shall be installed without springing or forcing the pipe in a manner which would induce stresses in the pipe, valves, or connecting equipment.

Piping shall be supported in conformance with the Pipe Supports section.

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.

Water, gas, and air supply 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. Air supply piping shall be provided with sectionalizing valves and valved air inlet connections as needed for isolation of portions of the system for periodic testing. Gas supply lines to buildings shall be provided with a shutoff valve and union located above grade immediately outside the building. A capped drip leg shall be provided at the bottom of the vertical riser of gas supply piping adjacent to gas-fired appliances.

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.

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.

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.

Drilling and tapping of pipe walls for installation of pressure gauges or switches will not be permitted.

All chemical piping shall be installed so that lines are readily accessible for cleaning. Tees shall be provided at regular intervals in all chemical piping except chlorine piping, with extra openings plugged, to facilitate cleaning. Teflon thread tape or teflon thread sealer shall be applied to the threads of the plugs so that

they can be easily removed. At each point where hose or reinforced plastic tubing is connected to rigid piping, a quick-disconnect coupling shall be provided.

Double-contained chemical feed piping shall be installed according to the manufacturer's recommendations. Joints shall be solvent cemented. Splitting and rewelding of fittings will not be acceptable. Suitable drains and vents shall be provided to permit complete drainage of both the primary and secondary containment piping. Interstitial supporting devices shall be designed to allow continuous drainage in the annular space to the drain ports. Drain fittings shall be designed to allow a valve attachment to be made so that the secondary containment compartment can be readily drained and manually inspected for leaks.

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.

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.

3-3.05. Reducers. Eccentric reducers shall be installed flat on the bottom for steam, condensate return and digester gas services.

3-3.06. 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.

3-4. PIPING ASSEMBLY.

3-4.01. General. 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

Any deviations from the Specifications or piping locations shown on the Drawings require prior review and approval by Engineer.

3-5. PROTECTIVE COATING. Not Used.

3-6. PRESSURE AND LEAKAGE TESTING. All new piping systems shall be pressure tested. The Engineer may waive pressure testing requirements for

piping connections to existing piping systems. All specified tests shall be made by and at the expense of Contractor in the presence, and to the satisfaction of 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:

<u>Service</u>	<u>Test Pressure</u>	<u>Test Medium</u>
Water supply	1-1/2 times working pressure but not less than 120 psi	Water
Chemical piping	Per drawings	Per drawings
Other piping	1-1/2 times working pressure but not less than 50 psi	Suitable fluid or gas; for distilled water piping, distilled water or filtered oil-free compressed air may be used

Compressed air or pressurized gas shall not be used for testing plastic piping unless specifically recommended by the pipe manufacturer.

Leakage may be determined by loss-of-pressure, soap solution, chemical indicator, or other positive and accurate method acceptable to 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.

Unless otherwise required by the applicable codes, drainage and venting systems shall be water 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.

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. Contractor shall give Engineer 5 working days advanced notice of scheduled testing.

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.

3-7. CLEANING. 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 Engineer.

3-8. ACCEPTANCE. reserves the right to have any section of the piping system which he suspects may be faulty cut out of the system by for inspection and testing. Should the joint prove to be sound, Owner 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 15067

MISCELLANEOUS PLASTIC PIPE

PART 1 - GENERAL

1-1. SCOPE. 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.

1-2. SUBMITTALS.

1-2.01. Drawings and Data. Complete specifications, data and catalog cuts or drawings shall be submitted in accordance with the Greenbook and Whitebook Submittals section. Submittals are required for all piping, fittings, gaskets, sleeves, and accessories, and shall include the following data:

- Name of Manufacturer
- Type and model
- Construction materials, thickness, and finishes
- 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.

1-3. DELIVERY, STORAGE, AND HANDLING. Shipping shall be in accordance with the Product Delivery Requirements section. Handling and storage shall be in accordance with the Product Storage and Handling Requirements section. All materials shall be stored in a sheltered location above the ground, separated by type, and shall be supported to prevent sagging or bending.

Pipe, tubing, and fittings shall be stored between 40°F and 90°F .

PART 2 - PRODUCTS

2-1. FRP PIPE. Not used.

2-2. PVC PIPE MATERIALS. PVC pipe materials and services shall be as specified herein.

2-2.01. Material Classification PVC-1. Not used.

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2-2.02. Material Classification PVC-2.

PVC-2 – Schedule 80 PVC Pipe with Solvent Welded Joints.	Pipe	ASTM D1785, Cell Classification 12454, bearing NSF seal, Schedule 80.
	Fittings	ASTM D2467, Cell Classification 12454, bearing NSF seal. Flanges or unions shall be provided where needed to facilitate disassembly of equipment or valves. Flanges or unions shall be joined to the pipe by a solvent weld. When acceptable to Engineer, threaded joints may be used instead of solvent welded joints in exposed interior locations for the purpose of facilitating assembly. The use of threaded joints in this system shall be held to a minimum.

2-2.03. Material Classification PVC-3. Not used.

2-2.04. Material Classification PVC-4. Not used.

2-2.05. Material Classification PVC-5. Not used.

2-2.06. Material Classification PVC-6. Not used.

2-2.07. Material Classification PVC-7. Not used.

2-2.08. Material Classification PVC-8. Not used.

2-2.09. 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.

2-3. CPVC PIPE. CPVC pipe materials and services shall be as specified herein.

2-3.01. Material Classification CPVC-1.

CPVC-1 – Schedule 80 CPVC Pipe with Solvent Welded Joints. Sodium hydroxide (caustic soda) solution piping. Sulfuric acid piping. Sodium hypochlorite solution piping. Ferric chloride solution piping. Ferrous chloride solution piping. Neat polymer and polymer solution piping.	Pipe Fittings	ASTM F441, Cell Classification 23447, bearing NSF seal, Schedule 80. ASTM F439, Cell Classification 23447, bearing NSF seal. Flanges or unions shall be provided where needed to facilitate disassembly of equipment or valves. Flanges or unions shall be joined to the pipe by a solvent weld. When acceptable to Engineer, threaded joints may be used instead of solvent welded joints in exposed interior locations for the purpose of facilitating assembly. The use of threaded joints in this system shall be held to a minimum.
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2-3.02. Material Classification CPVC-2.

CPVC-2 – Double-Contained Chemical Feed Pipe. Ferric chloride solution piping. Ferrous chloride solution piping.	System	Prefabricated system consisting of primary pipe supported within secondary containment piping.
	Primary Pipe	ASTM F441, Cell Classification 23447, bearing NSF seal, Schedule 80.
	Containment Pipe	Same as primary pipe.
	Pipe Manufacturer	Asahi, George Fischer, and IPEX, with manufacturer's standard spacers, fittings, and suitable chemical service solvent
	Interstitial Supporting Devices	Polypropylene spider clips or C-type, within the secondary containment pipe.

2-3.03. Accessory Materials. Accessory materials for the CPVC Pipe systems shall be as indicated.

Flanges	Diameter and drilling shall conform to ANSI/ASME B16.5, Class 150.
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 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.

2-4. PE PIPE. Not used.

2-5. POLYPROPYLENE PIPE. Not used.

2-5.01. Material Classification PP-1. Not used.

2-5.02. Material Classification PP-2. Not used.

2-5.03. Material Classification PP-3. Not used.

2-6. PVDF PIPE. Not used.

2-7. REINFORCED PLASTIC TUBING. Not used.

PART 3 - EXECUTION

3-1. INSTALLATION. Materials furnished under this section will be installed in accordance with the Miscellaneous Piping and Accessories Installation section.

End of Section

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Section 15091

MISCELLANEOUS BALL VALVES

PART 1 - GENERAL

1-1. SCOPE. This section covers the furnishing of manually operated or remote activated two position (open-close) ball valves as specified herein.

Miscellaneous ball valves shall be provided where AWWA type ball valves are not required.

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.

1-2. GENERAL.

1-2.01. General Equipment Stipulations. The General Equipment Stipulations shall apply to all equipment and materials furnished under this section. If the requirements in this section are different from those in the General Equipment Stipulations, the requirements in the section shall take precedence.

1-2.02. Identification. Valves specified herein shall be tagged in accordance with the Equipment and Valve Identification section.

1-3. SUBMITTALS. Complete drawings, details, and specifications covering the valves and their appurtenances shall be submitted in accordance with the Greenbook and Whitebook Submittals section. Included in the submittal shall be drawings by the valve manufacturer to indicate the position of the valve actuator and valve shaft.

PART 2 - PRODUCTS

2-1. CONSTRUCTION. Ball valves shown on the drawing, but not specified herein, shall be selected to match piping material they are installed in.

2-1.01. Valves Type VB-1. Not used.

2-1.02. Valves Type VB-2. Not used.

2-1.03. Valves Type VB-3. Not used.

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2-1.04. Valves Type VB-4. Not used.

2-1.05. Valves Type VB-5. Not used.

2-1.06. Valves Type VB-6. Not used.

2-1.07. Valves Type VB-7. Not used.

2-1.08. Valves Type VB-8. Not used.

2-1.09. Valves Type VB-9. Not used.

2-1.10. Valves Type VB-10.

VB-10	Rating	150 psig nonshock cold WOG
Service as specified in Miscellaneous Plastic Pipe, Tubing, and Accessories section	Type	In-line, true union, full port (Schedule 80) PVC or CPVC to match piping system
	Body/Bonnet	Teflon
	Trim	PVC or CPVC to match piping system
	Seat	PVC or CPVC to match piping system
	Ball	Teflon
4 inch and smaller	Stem	Viton O-ring Viton O-rings
	Thrust Washer	Socket
Socket	Stem Seal	0 to 140°F
	Body Seals	Electronic actuator, handle, or lever as indicated in schedule
	End Connection	Hayward Plastic Products "True Union Ball Valve"; Nibco "Chemtrol TU Series Tru-Bloc Ball Valve"; Spears
	Temp. Limitations	Manufacturing Co "True Union 2000 Standard Series 3600 Ball Valve"
	Valve Operator	
	Manufacturers	

2-1.11. Valves Type VB-11.

VB-11	Rating	150 psig nonshock cold WOG
Service as specified in Miscellaneous Plastic Pipe, Tubing, and Accessories section	Type	In-line, true union, full port (Schedule 80)
	Body/Bonnet	PVC or CPVC to match piping system
4 inch and smaller	Trim	Teflon
	Seat Ball	PVC or CPVC to match piping system
Flanged	Stem	PVC or CPVC to match piping system
	Thrust Washer	Teflon
	Stem Seal	Viton O-ring
	Body Seals	Viton O-rings
	End Connection	Flanged, ASME B16.5, Class 150, raised face
	Temp. Limitations	0 to 140°F
	Valve Operator	Electronic actuator, handle, or lever as indicated in schedule
	Manufacturers	Hayward Plastic Products "True Union Ball Valve"; Nibco "Chemtrol TU Series Tru-Bloc Ball Valve"; Spears Manufacturing Co. "True Union 2000 Standard Series 3600 Ball Valve"

2-1.12. Valves Type VB-12. Not used.

2-1.13. Valves Type VB-13. Not used.

2-1.14. Valves Type VB-14. Not used.

2-1.15. Valves Type VB-15. Not used.

2-1.16. Valves Type VB-16. Not used.

2-1.17. Valves Type VB-17. Not used.

2-1.18. 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.

2-2. VALVE ACTUATORS. Ball valve, except those which are equipped with power actuators or are designed for automatic operation, shall be provided with manual actuators. Powered actuators, including specific actuators for each area of the plant, are covered in the Valve and Gate Actuators section (Section 15180). Unless otherwise specified or indicated on the valve schedules (in design drawing set) and drawings, each manual actuator shall be equipped with a lever operator. Ball valves with center lines more than 7'-6" above the floor shall be provided with chain levers.

Valves indicated to be electric motor operated on the drawings shall have reversible electric motor operators designed for 120 volt ac, single phase operation. Actuators shall include integral thermal overload protection and a declutchable manual override. Actuators shall be equipped with motor operation limit switches and two additional single-pole, double-throw limit switches for auxiliary open and closed indication. An internal heater and thermostat shall be provided in each actuator housing to prevent condensation. Actuators in Class I, Division 1 and Division 2, Group D hazardous areas indicated on the drawings shall have NEMA Type 7 housings. Actuators in other areas shall have NEMA Type 4X housings.

2-3. ACCESSORIES. If the drawings indicate the need for extension stems, stem guides; position indicator; floor boxes; valve boxes; or operating stands, refer to the Valve and Gate Actuator section.

PART 3 - EXECUTION

3-1. INSPECTION. 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 the Engineer before its use.

3-2. INSTALLATION.

3-2.01. 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.

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3-3. VALVE ACTUATORS. Valve actuators and accessories shall be factory mounted on the valve, calibrated, and tested by the valve or actuator manufacturer. Valve extension stems shall be provided per valve manufacturer.

3-4. FIELD QUALITY CONTROL.

3.4.01. Field Testing. After installation, all valves shall be tested in accordance with the Miscellaneous Piping And Accessories Installation section.

3-4.01.01. Pressure Tests. Pressure testing shall be in accordance with the Miscellaneous Piping And Accessories Installation section.

3-4.01.02. Leakage Tests. All valves shall be free from leaks. Each leak that is discovered within the correction 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.

3-5. ADJUSTING. After installation, the opening and closing time shall be adjusted as needed for each pneumatic, hydraulic and electric actuated valve.

End of Section

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Section 15092

INDUSTRIAL BUTTERFLY VALVES

PART 1 - GENERAL

1-1. SCOPE. This section covers the furnishing of manual or remote operated industrial butterfly valves as specified herein and as indicated in the Industrial Butterfly Valve Schedule.

Industrial type butterfly valves shall be provided where AWWA type butterfly valves are not required.

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. Powered actuators, including specific actuators for each area of the plant, are covered in the Valve and Gate Actuators section.

1-2. GENERAL.

1-2.01. 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.

1-2.02. Temporary Number Plates. Not used.

1-2.03. Identification. Valves specified herein shall be tagged in accordance with the Equipment and Valve Identification section.

1-3. SUBMITTALS. Complete drawings, details, and specifications covering the valves and their appurtenances shall be submitted in accordance with the Greenbook and Whitebook Submittals section. Included in the submittal shall be drawings by the valve manufacturer to indicate the position of the valve actuator and valve shaft.

Drawings shall include separate wiring diagrams for each electrically operated or controlled valve and the electrical control equipment. Each drawing shall be identified with the valve number or name as specified in this section.

PART 2 - PRODUCTS

2-1. CONSTRUCTION. Unless otherwise specified, industrial butterfly valves shall be the rubber-seat, tight-closing type. Valves specified with an electric, air,

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or hydraulic actuators shall be the lugged wafer style. Valve discs shall seat at 90 degrees with the pipe axis.

Industrial butterfly valves with center lines more than 7'-6" above the floor shall be provided with chain-wheels and operating chains as specified herein.

Flanged end valves shall be of the short-body type. Where mechanical joint ends are specified, in the valve schedule, either mechanical joint or push-on ends conforming to ANSI/AWWA C111/A21.11 will be acceptable. For buried or submerged service, shaft seals shall be O-ring type.

2-1.01. Valves VBF-1. Not used.

2-1.02. Valves VBF-2. Not used.

2-1.03. Valves VBF-3. Not used.

2-1.04. Valves VBF-4.

VBF-4 Neat polymer system	Rating	Class 150
	Body	PVC, molded
	Shaft	AISI Type 316 stainless steel
	Trim	
	Seat	FPM (Viton)
	Disc	PVC or polypropylene
	Stem	316 stainless steel
	Stem Seal	Synthetic O-rings
	Shaft Bearings	Upper and lower bearings, reinforced Teflon
	End Connection	Flanged, ASME B16.5, Class 150 diameter and drilling
Manual Valve Operator	Lever	
Manufacturer	Asahi American "Type 56", Chemtrol "Model B"	

2-1.05. 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.

2-2. VALVE ACTUATORS. Manual actuated valves 6 inches and smaller, unless chain-wheel actuators are required, shall be provided with levers as specified herein. Valves 8 inches and larger shall have enclosed, geared, hand-wheel or chain-wheel actuators with position indicators as specified herein.

Requirements for automatic valve actuators shall be as specified herein, as indicated in the Industrial Butterfly Valves Schedule, and as specified in the Valve and Gate Actuator section.

2-2.01. Manual Actuators. Manual actuators of the types listed herein and in the Industrial Butterfly Valves Schedule shall be provided by the valve manufacturer.

Unless otherwise indicated or specified, each geared manual actuator shall be equipped with an operating hand-wheel.

The direction of rotation of the wheel, wrench nut, or lever to open the valve shall be to the left (counterclockwise). Each valve body or actuator shall have cast thereon the word "Open" and an arrow indicating the direction to open.

The housing of traveling-nut type actuators shall be fitted with a removable cover which shall permit inspection and maintenance of the operating mechanism without removing the actuator from the valve. Travel limiting devices shall be provided inside the actuator for the open and closed positions. Travel limiting stop nuts or collars installed on the reach rod of traveling-nut type operating mechanisms shall be field adjustable and shall be locked in position by means of a removable roll pin, cotter pin, or other positive locking device. The use of stop nuts or adjustable shaft collars which rely on clamping force or setscrews to prevent rotation of the nut or collar on the reach rod will not be acceptable.

Each actuator shall be designed so that shaft seal leakage cannot enter the actuator housing.

Valves for throttling service shall be equipped with an infinitely variable locking device or a totally enclosed gear actuator.

Actuators shall produce the required torque with a maximum pull of 60 lbs on the lever, hand-wheel, or chain. Actuator components shall withstand, without damage, a pull of 200 lbs on the hand-wheel or chain-wheel or an input of 300 foot-lbs on the operating nut.

2-2.02. Handwheels. Handwheel diameters shall be as recommended by the valve manufacturer.

2-2.03. Levers. Levers shall be capable of being locked in at least five intermediate positions between fully open and fully closed.

2-3. ACCESSORIES. Requirements for extension stems and stem guides, position indicators, floor boxes, operating stands, torque tubes, and valves boxes shall be as specified in Valve and Gate Actuator section, and as indicated in the Industrial Butterfly Valves Schedule.

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PART 3 - EXECUTION

3-1. INSPECTION. 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 the Engineer before its use.

3-2. INSTALLATION.

3-2.01. 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.

3-3. VALVE ACTUATORS. Valve actuators and accessories shall be factory mounted on the valve, calibrated, and tested by the valve or actuator manufacturer. Valve extension stems shall be provided per valve manufacturer.

3-4. FIELD QUALITY CONTROL.

3.4.01. Field Testing. After installation, all valves shall be tested in accordance with the Miscellaneous Piping And Accessories Installation section.

3-4.01.01. Pressure Tests. Pressure testing shall be in accordance with the Miscellaneous Piping And Accessories Installation section.

3-4.01.02. Leakage Tests. All valves shall be free from leaks. Each leak that is discovered within the correction 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.

3-5. ADJUSTING. After installation, the opening and closing time shall be adjusted as needed for each pneumatic, hydraulic and electric actuated valve.

End of Section

Section 15093

CHECK VALVES

PART 1 - GENERAL

1-1. SCOPE. This section covers the furnishing of check valves as specified herein and as indicated in the Check Valve Schedule.

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.

1-2. GENERAL. Equipment furnished under this section shall be fabricated and assembled in full conformity with Drawings, Specifications, engineering data, instructions, and recommendations of the equipment manufacturer unless exceptions are noted by Engineer.

Valves shall be furnished with all necessary parts and accessories indicated on the Drawings, specified, otherwise required for a complete, properly operating installation and shall be the latest standard products of a manufacturer regularly engaged in the production of valves.

1-2.01. 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.

1-2.02. Temporary Number Plates. Not used.

1-2.03. Identification. Valves specified herein shall be tagged in accordance with the Equipment and Valve Identification section.

1-3. SUBMITTALS. Complete drawings, details, and specifications covering the valves and their appurtenances shall be submitted in accordance with the Greenbook and Whitebook Submittals section. Included in the submittal shall be drawings by the valve manufacturer to indicate the position of the valve actuator and valve shaft.

PART 2 – PRODUCTS

2-1. CONSTRUCTION.

2-1.01. Valves VC-1. Not used.

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- 2-1.02. Valves VC-2. Not used.
- 2-1.03. Valves VC-3. Not used.
- 2-1.04. Valves VC-4. Not used.
- 2-1.05. Valves VC-5. Not used.
- 2-1.06. Valves VC-6. Not used.
- 2-1.07. Valves VC-7. Not used.
- 2-1.08. Valves VC-8. Not used.
- 2-1.09. Valves VC-9. Not used.
- 2-1.10. Valves VC-10. Not used.
- 2-1.11. Valves VC-11. Not used.
- 2-1.12. Valves VC-12. Not used.
- 2-1.13. Valves VC-13.

VC-13	Rating	150 psig nonshock
Service as specified in Miscellaneous Plastic Pipe section	Type	Ball check, true union
Socket ends	Body	PVC or CPVC, material shall match pipe material
3 inch and smaller PVC or CPVC pipe	Trim	PVC or CPVC, material shall match pipe material
	Ball	PVC or CPVC, material shall match pipe material
	Seat	Viton
	Seals	Viton
	End Connection	Socket
	Temp. Limitations	0 to 140°F
	Manufacturers	Hayward Plastics Products "Ball Check Valve", Nibco "Chemtrol True Union Ball Check Valve", Spears Manufacturing Co. "True Union 2000 Industrial Series 4500 Ball Check Valves"

2-1.14. Valves VC-14.

VC-14	Rating	150 psig nonshock
Service as specified in Miscellaneous Plastic Pipe Section	Type	Ball check, true union
	Body/Bonnet	PVC or CPVC, material shall match pipe material
Flanged ends	Trim	
	Ball	PVC or CPVC, material shall match pipe material
3 inch and smaller PVC or CPVC pipe	Seat	Viton
	Seals	Viton
	End Connection	Flanged, ASME B16.5, Class 150, raised face
	Temp. Limitations	0 to 140°F
	Manufacturers	Hayward Plastics Products "Ball Check Valve", Nibco "Chemtrol True Union Ball Check Valve", Spears Manufacturing Co. "True Union 2000 Industrial Series 4500 Ball Check Valves"

2-1.15. Valves VC-15. Not used.

2-1.16. Valves VC-16. Not used.

2-1.17. Valves VC-17.

VC-17	Rating	100 psig nonshock
Chemical piping vacuum relief service	Type	Diaphragm, two piece
	Body	PVC
PVC or CPVC pipe	Trim	
	Diaphragm	Chemical resistant
	End Connection	Threaded
	Temp. Limitations	0 to 140°F
	Manufacturers	Plast-O-Matic "Series CKM Check Valves" or "Series VB Vacuum Breakers"

2-1.18. Valves VC-18. Not used.

2-1.19. Valves VC-19. Not used.

PART 3 - EXECUTION

3-1. INSPECTION. 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 the Engineer before its use.

3-2. INSTALLATION.

3-2.01. 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.

3-3. VALVE ACTUATORS. Valve actuators and accessories shall be factory mounted on the valve, calibrated, and tested by the valve or actuator manufacturer. Valve extension stems shall be provided per valve manufacturer.

3-4. FIELD QUALITY CONTROL.

3.4.01. Field Testing. After installation, all valves shall be tested in accordance with the Miscellaneous Piping And Accessories Installation section.

3-4.01.01. Pressure Tests. Pressure testing shall be in accordance with the Miscellaneous Piping And Accessories Installation section.

3-4.01.02. Leakage Tests. All valves shall be free from leaks. Each leak that is discovered within the correction 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.

3-5. ADJUSTING. After installation, the opening and closing time shall be adjusted as needed for each pneumatic, hydraulic and electric actuated valve.

End of Section

Section 15097

PINCH AND DIAPHRAGM VALVES

PART 1 - GENERAL

1-1. SCOPE. This section covers the furnishing of manually operated or remote activated two position (open-close) or modulating pinch and diaphragm valves.

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. Valve actuators, including specific actuators for each area of the plant, are covered in the Valve and Gate Actuator section.

1-2. GENERAL.

1-2.01. 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.

1-2.02. Identification. Valves specified herein shall be tagged in accordance with the Equipment and Valve Identification section.

1-3. SUBMITTALS. Complete drawings, details, and specifications covering the valves and their appurtenances shall be submitted in accordance with the Greenbook and Whitebook Submittals section.

PART 2 - PRODUCTS

2-1. PINCH VALVE CONSTRUCTION.

2-1.01. Valves VPN-1. Not used.

2-2. DIAPHRAGM VALVE CONSTRUCTION.

2-2.01. Valves VD-1. Diaphragm valves used in sodium hypochlorite and sodium hydroxide service shall be provided with socket weld ends. Flanged ends may be used where required to facilitate disassembly of piping or equipment, or where acceptable to the Engineer.

VD-1 Sodium hypochlorite & Sodium Hydroxide system.	Rating	Class 150
	Body	CPVC
	Trim	
	Diaphragm	Two-piece unbonded, Teflon and EPDM
	End Connection	Socket weld, flanged, ASME B16.1, Class 125, flat faced
Operator	Handwheel with travel-stop & position indicator	
Manufacturers	Asahi/America "Type G", "Type 14 Diaphragm Valves", or "Type 15 Diaphragm Valves", ITT "Dia-Flo Valves"	

2-3. VALVE ACTUATORS. Manual actuated valves shall be provided with handwheels as specified herein. Requirements for automatic valve actuators shall be as specified herein, as indicated in the Pinch and Diaphragm Valve Schedule, and as specified in the Valve and Gate Actuators section.

2-3.01. Manual Actuators. Manual actuators of the types listed herein and in the Pinch and Diaphragm Valve Schedule (in design drawing set), shall be provided by the valve manufacturer.

Unless otherwise indicated or specified, each geared manual actuator shall be equipped with an operating handwheel.

The direction of rotation of the wheel to open the valve shall be to the left (counterclockwise). Each valve body or actuator shall have cast thereon the word "Open" and an arrow indicating the direction to open.

The housing of traveling-nut type actuators shall be fitted with a removable cover which shall permit inspection and maintenance of the operating mechanism without removing the actuator from the valve. Travel limiting devices shall be provided inside the actuator for the open and closed positions. Travel limiting stop nuts or collars installed on the reach rod of traveling-nut type operating mechanisms shall be field adjustable and shall be locked in position by means of a removable roll pin, cotter pin, or other positive locking device. The use of stop nuts or adjustable shaft collars which rely on clamping force or setscrews to prevent rotation of the nut or collar on the reach rod will not be acceptable.

Each actuator shall be designed so that shaft seal leakage cannot enter the actuator housing.

Valves for throttling service shall be equipped with an infinitely variable locking device or a totally enclosed gear actuator.

Actuators shall produce the required torque with a maximum pull of 60 lbs on the lever, handwheel, or chain. Actuator components shall withstand, without damage, a pull of 200 lbs on the handwheel or chainwheel or an input of 300 foot-lbs on the operating nut.

2-3.02. Handwheels. Handwheel diameters shall be as recommended by the valve manufacturer.

2-3.03. Chainwheels. Not used.

2-4. ACCESSORIES. Requirements for extension stems and stem guides, position indicators, floor boxes, operating stands, torque tubes, and valve boxes shall be as specified in the Valve and Gate Actuators section and as indicated in the Pinch and Diaphragm Valves Schedule.

PART 3 - EXECUTION

3-1. INSPECTION. 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 the Engineer before its use.

3-2. INSTALLATION.

3-2.01. 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.

3-3. VALVE ACTUATORS. Valve actuators and accessories shall be factory mounted on the valve, calibrated, and tested by the valve or actuator manufacturer. Valve extension stems shall be provided per valve manufacturer.

3-4. FIELD QUALITY CONTROL.

3.4.01. Field Testing. Not required due to limited shutdown requirements.

3-4.01.01. Pressure Tests. Not required due to limited shutdown requirements.

3-4.01.02. Leakage Tests. All valves shall be free from leaks. Each leak that is discovered within the correction 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.

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3-5. ADJUSTING. After installation, the opening and closing time shall be adjusted as needed for each pneumatic, hydraulic and electric actuated valve.

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Section 15140

PIPE SUPPORTS

PART 1 - GENERAL

1-1. SCOPE. This section covers the furnishing and installation of pipe hangers, brackets, supports, bracing, anchorage, and the design for the pipe support system for pipes 12 inches and smaller. Pipe supports shall be furnished complete with all necessary inserts, bolts, nuts, rods, washers, and other accessories. This section also covers the spacing of expansion joints in pipes 12 inches in diameter and smaller. Expansion joint products and materials are covered in the respective piping sections.

This section covers pipe supports for the following pipe materials:

- PVC/CPVC Schedule 80 (chemical service)
- PVC/CPVC Schedule 80 (other)
- PVC Schedule 40

1-2. GENERAL. Contractor shall provide pipe supports, anchors, flexible couplings, and expansion joints for all piping systems. The Drawings indicate pipe supports, anchors, flexible couplings, and expansion joints for pipes larger than 12 inches in diameter, and in special cases for pipes that are 12 inches and smaller. Contractor shall design anchors, pipe supports, expansion joints, and flexible couplings not already shown on the Drawings, in accordance with the requirements specified herein.

Contractor's design shall include pipe supports, bracing, and anchorage adjacent to expansion joints, couplings, valves, in-line devices, equipment, wyes and tees, or changes in direction as required for dismantling piping, removing valves or other in-line devices, disconnecting piping from equipment, and pipe support, in addition to supports in accordance with the maximum spacing specified herein. The pipe support system design by Contractor shall rigidly support pipe so there is no visible movement or visible sagging between supports. The system shall comply with specified piping code requirements.

Contractor shall not delete or relocate the supports, expansion joints, or couplings indicated on the Drawings without written approval of Engineer.

Pipe supports and expansion joints are not required in buried piping, but concrete blocking or other suitable anchorage shall be provided as indicated on the Drawings or specified in other sections.

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1-2.01. General Equipment Stipulations. The General Equipment Stipulations shall apply to all supports furnished under this section. If requirements in this specification differ from those in the General Equipment Stipulations, the requirements specified herein shall take precedence.

1-3. SUBMITTALS. Complete data, catalog information, and drawings covering fabricated pipe supports, fabricated inserts, and stainless steel, galvanized, and copper-plated and plastic-coated pipe supports shall be submitted in accordance with the Greenbook and Whitebook Submittals section.

Data shall include a listing of the intended use and general location of each item submitted.

When a wind and/or seismic design is required, Contractor shall submit confirmation of compliance with the Meteorological and Seismic Design Criteria section.

PART 2 - PRODUCTS

2-1. MATERIALS. Unless otherwise indicated, all pipe supports shall comply with ANSI/MSS SP-58 and MSS SP-69. Materials of construction for fabricated steel supports are covered in the Structural and Miscellaneous Metals section. All pipe support materials shall be packaged as necessary to ensure delivery in satisfactory condition.

Unless otherwise specified or indicated on the Drawings, pipe supports shall be fabricated of manufacturer's standard materials and provided with manufacturer's standard finish.

Design loads for inserts, brackets, clamps, and other support items shall not exceed the manufacturer's recommended loads.

Pipe supports shall be manufactured for the sizes and types of pipe to which they are applied. Strap hangers will not be acceptable. Threaded rods shall have sufficient threading to permit the maximum adjustment available in the support item. Continuously threaded rod is not acceptable for hanger rods over 12 inches in length.

Unless accepted by Engineer, the use of supports which rely on stressed thermoplastic components to support the pipe will not be permitted.

Contact between dissimilar metals, including contact between stainless steel and carbon steel, shall be prevented. Portions of pipe supports which come into contact with other metals that are dissimilar shall be rubber or vinyl coated.

Pipe support types and application shall comply with Table 1.

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2-2. WIND AND SEISMIC LOADS. Wind and seismic loads for worst case conditions of either full, partially full, or empty pipes shall be considered in the design. Seismic design requirements for products specified herein shall be as indicated in the Meteorological and Seismic Design Criteria section.

PART 3 - EXECUTION

3-1. APPLICATION. Concrete inserts or anchor bolts shall be used to support piping from new cast-in-place concrete. Fastening of supports to existing concrete and masonry shall be in accordance with the Anchorage in Concrete and Masonry section.

Anchorage shall be provided to resist thrust due to temperature changes, changes in diameter or direction, or dead-ending. Anchors shall be located as specified to force expansion and contraction movement to occur at expansion joints, loops, or elbows, and as needed to prevent excessive bending stresses and opening of mechanical couplings. Anchorage for temperature changes shall be centered between elbows and mechanical joints used as expansion joints. Anchorage for bellows type expansion joints may be located adjacent to the joint.

When expansion joints are required, pipe guides shall be provided adjacent to bellows type expansion joints. Guides will not be required where mechanical couplings are permitted as expansion joints. Guides shall be located on both sides of expansion joints, except where anchors are adjacent to the joint. Unless otherwise indicated on the Drawings, one guide shall be within four pipe diameters from the joint and a second guide within 14 pipe diameters from the first guide. Pipe supports shall allow adequate movement; pipe guides shall not be used for anchoring pipe against longitudinal forces. Pipe guides shall be provided at locations as recommended by the manufacturer.

Pipe supports for insulated cold piping systems shall be sized for the outside diameter of the insulated pipe, and an insulation protection shield shall be installed between the support and the insulation. Rigid insulation inserts shall be installed between the pipe and the insulation shields for piping larger than 2 inches or when needed to prevent crushing of the insulation. Inserts shall be of the same thickness as the adjacent insulation and shall be vapor sealed.

Insulated hot piping systems shall be supported by clevises, clamps, support saddles, or rollers. Pipe clamps shall be attached directly to the pipe. Support saddles and rollers shall be sized for the outside diameter of the insulated pipe, and an insulation protection saddle shall be installed at the support.

3-2. TYPES OF SUPPORTS. The products for pipe supports shall be as indicated in Table 1 for the specified type and size of support. Where stainless steel is specified for pipe supports but is not available from the name suppliers for the model specified in Table 1, Contractor shall provide a heavier duty support that is available in stainless steel.

TABLE 1 - TYPES OF SUPPORTS

<u>Description and Service</u>	<u>MSS SP 69 Type (Note 1)</u>	<u>Specification</u>
Hangers 2-1/2 inch and smaller pipe		
For hot and cold insulated piping Clevis	1	B-Line "B3100", Anvil "260" Piping Technology & Products Fig. 83.
Other services J-style	5	B-Line "B3690", Anvil "67", Unistrut "J Hanger", or Piping Technology & Products Fig. 67.
Clevis	1	B-Line "B3104", Anvil "260", or Piping Technology & Products Fig 83.
3 Through 12 inch pipe (Note 3)		
For hot insulated piping Double bolt	3	B-Line "B3144", Anvil "295", or Piping Technology & Products Fig. 70.
For cold insulated piping Clevis	1	B-Line "B3100", Anvil "260", or Piping Technology & Products Fig 83 .
For uninsulated cold piping Clamp	4	B-Line "3140", Anvil "212", or Piping Technology & Products Fig. 50.

TABLE 1 - TYPES OF SUPPORTS

<u>Description and Service</u>	<u>MSS SP 69 Type (Note 1)</u>	<u>Specification</u>
Clevis	1	B-Line "B3100", Anvil "260", or Piping Technology & Products Fig 83.
Other services Clevis	1	B-Line "B3100" or Anvil "260" for steel pipe; B-Line "B3102", Anvil "590", or Piping Technology & Products Fig. 83 C. L. for cast iron pipe.
Concrete Inserts, Steel 12 inch and smaller pipe	18	Channel 12 ga , galv, 1-5/8 by 1-3/8 inches , min. 8 inches long, anchor lugs on 4 inch centers, at least three lugs, end caps, and filler strip.
Beam Clamps, Malleable Iron or Steel, 12 inch and smaller pipe	21 28, 29	B-Line "3050" and "3055", Anvil "133" and "134", or Piping Technology & Products Fig. 130 and Fig. 130 (SP). Anvil "292" or Piping Technology & Products Fig. 140.
	30	B-Line "3054", Anvil "228", or Piping Technology & Products Fig. 140.
Side Beam Bracket	34	B-Line "B3062", Anvil "202", or Piping Technology & Products Fig. 20L.
Wall Supports and Frames, Steel, 12 inch and smaller pipe (Note 2)		
Brackets	32	B-Line "B3066", Anvil "195", or Piping Technology & Products Fig. 76.
	33	B-Line "B3067", Anvil "199", or Piping Technology & Products Fig. 76.

TABLE 1 - TYPES OF SUPPORTS

<u>Description and Service</u>	<u>MSS SP 69 Type (Note 1)</u>	<u>Specification</u>
Prefabricated channels	--	12 ga , galv, 1-5/8 inches , with suitable brackets and pipe clamps.
Offset pipe clamp, 1-1/2 inch and smaller pipe	--	Galv, 1-1/4 by 3/16 inch steel, with 3/8 inch bolts.
Offset pipe clamp, 2 to 3-1/2 inch pipe	--	Galv, 1-1/4 by 1/4 inch steel, with 3/8 inch bolts.
Floor Supports, Steel or Cast Iron		
6 inch and smaller pipe	37 (with base)	B-Line "B3090", Anvil "259" or Piping Technology & Products Fig. 48.
8 through 12 inch pipe	38	B-Line "B3093", Anvil "264" or Piping Technology & Products Fig. 46.
Pipe Alignment Guides	--	B-Line "B3281" through "B3287", Anvil "255", or Piping Technology & Products Fig. 6.
Turnbuckles Steel	13	B-Line "B3202", Anvil "230", or Piping Technology & Products Fig. 30.
Hanger Rods, Carbon Steel, Threaded Both Ends, 3/8 inch minimum size	--	B-Line "B3205", Anvil "140", or Piping Technology & Products Fig. 128.
Weldless Eye Nut, steel	17	B-Line "B3200", Anvil "290", or Piping Technology & Products Fig. 40.
Insulation Protection Saddle	39	B-Line "B3160 Series", Anvil "160 Series", or Piping Technology & Products Fig. 184.
Insulation Protection Shield	40	B-Line "B3151", Anvil "167", or Piping Technology & Products Fig. 183.

Table 1 Notes:

1. MSS SP-69 supports and hangers are illustrated on Figure 1-15140.

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2. Pipe clamps or other devices which rely on the application of a clamping force to the supported pipe in order to maintain the clamp position or location in a prefabricated channel or track will not be acceptable for use with nonmetallic pipe or tubing.
3. Alternatively, pipe hangers for 12 inch pipe may be saddle type as indicated on the Drawings.

3-3. SUPPORT SPACINGS. Pipe supports and expansion joints shall be spaced in accordance with Tables 2, 3, 4, and 5. The types of pipes to be supported are as specified herein. Table 2 covers spacings for the standard operating conditions specified for each pipe material. Tables 3 and 4 cover PVC and FRP pipe spacings where operating conditions are in excess of the temperature and specific gravity requirements covered in Table 2. Table 5 covers PVC and FRP pipe which carries air or liquids with a specific gravity other than 1.0. Spacing in the tables is the maximum spacing considering gravity loads. Where Contractor's design includes lateral and longitudinal forces due to seismic loads, wind loads, and other forces, the spacing requirement may be less than that indicated in the tables.

TABLE 2 – MAXIMUM PIPE SUPPORT SPACING AT STANDARD TEMPERATURES AND SERVICES

<u>Type of Pipe</u>	<u>Pipe Support Max Spacing</u> <u>feet</u>	<u>Max Run Without Expansion</u> <u>Joint, Loop, or Bend</u> <u>(Note 1)</u> <u>feet</u>	<u>Expansion Joint Max Spacing</u> <u>(Note 2)</u> <u>feet</u>	<u>Type of Expansion Joints</u>
PVC, Schedule 80, for alum solution, caustic soda solution, ferric chloride solution, and hypochlorite solution at a maximum temperature of 100°F .				
1/8 and 1/4 inch	Continuous Support	20	60	Note 3
1/2 inch	3-1/2	20	60	Note 3
3/4 inch	4	20	60	Note 3
1 and 1-1/4 inch	4-1/2	20	60	Note 3
1-1/2 and 2 inch	5	20	60	Note 3
2-1/2 inch	5-1/2	20	60	Note 3
3 inch	6-1/2	20	60	Note 3
4 inch	7	20	60	Note 3
6 inch	8	20	60	Note 3
8 inch	9	20	60	Note 3

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TABLE 2 – MAXIMUM PIPE SUPPORT SPACING AT STANDARD TEMPERATURES AND SERVICES

<u>Type of Pipe</u>	<u>Pipe Support Max Spacing</u> <u>feet</u>	<u>Max Run Without Expansion</u> <u>Joint, Loop, or Bend</u> <u>(Note 1)</u> <u>feet</u>	<u>Expansion</u> <u>Joint Max Spacing</u> <u>(Note 2)</u> <u>feet</u>	<u>Type of Expansion</u> <u>Joints</u>
10 inch	9-1/2	20	60	Note 3
12 inch	10	20	60	Note 3
PVC, Schedule 80, for other services at a maximum temperature of 100°F and a maximum specific gravity of 1.0.				
1/8 and 1/4 inch	Continuous Support	20	60	Note 3
1/2 inch	4	20	60	Note 3
3/4 inch	4-1/2	20	60	Note 3
1 and 1-1/4 inch	5	20	60	Note 3
1-1/2 and 2 inch	5-1/2	20	60	Note 3
2-1/2 inch	6	20	60	Note 3
3 inch	7	20	60	Note 3
4 inch	7-1/2	20	60	Note 3
6 inch	8-1/2	20	60	Note 3
8 inch	9-1/2	20	60	Note 3
10 inch	10	20	60	Note 3
12 inch	11	20	60	Note 3
PVC, Schedule 40, for services at a maximum temperature of 100°F, and a maximum specific gravity of 1.0.				
1/8 and 1/4 inch	Continuous Support	20	60	Note 3
1/2 inch	3-1/2	20	60	Note 3
3/4 and 1 inch	4	20	60	Note 3
1-1/4 and 1-1/2 inch	4-1/2	20	60	Note 3
2 inch	5	20	60	Note 3
2-1/2 inch	5-1/2	20	60	Note 3
3 inch	6	20	60	Note 3
4 inch	6-1/2	20	60	Note 3
6 inch	7-1/2	20	60	Note 3
8 inch	8	20	60	Note 3
10 inch	8-1/2	20	60	Note 3
12 inch	9-1/2	20	60	Note 3

Table 2 Notes:

1. Unless otherwise acceptable to Engineer, an expansion joint shall be provided in each straight run of pipe having an overall length between loops or bends exceeding the maximum run specified herein.
2. Unless otherwise acceptable to Engineer, the spacing between expansion joints in any straight pipe run shall not exceed the maximum spacing specified herein.
3. Expansion joint fittings are specified in the respective piping sections.
4. At least two properly padded supports for each pipe section.
5. At least one support for each pipe section.
6. Expansion joints shall be mechanical couplings.
7. No expansion joints are required.
8. Supports for 5 and 10 foot long pipe sections shall be located within 18 inches of each joint. Supports shall be positioned to maintain the piping alignment and to prevent the piping from sagging.
9. References to specific gravity refer to liquid specific gravity and are referenced to water which is assumed to have a specific gravity of 1.0.

3-3.01. Temperature Adjustments for PVC Pipe. Not used.

3-3.02. Temperature Adjustments for FRP Pipe. Not used.

3-3.03. Specific Gravity Adjustments for PVC Pipe. PVC pipe shall have the maximum spacing indicated in Tables 2, 3, and 4 adjusted in accordance with the following table when the specific gravity of the liquid is greater than 1.0. (Note: Specific gravities listed are liquid specific gravities referenced to water which is assumed to have a specific gravity of 1.0.) Table 5 shall not apply to PVC pipe containing alum solution, caustic soda solution, ferric chloride solution, and hypochlorite solution, as these services are specifically covered in Table 2.

Table 5 shall be used for polymer solution.

TABLE 5 – MAXIMUM SUPPORT SPACING CORRECTION FACTORS
FOR PVC AND FRP PIPE

<u>Specific Gravity</u>	<u>Correction Factor</u>
1.0	1.00
1.1	0.98
1.2	0.96
1.4	0.93
1.6	0.90
2.0	0.85

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TABLE 5 – MAXIMUM SUPPORT SPACING CORRECTION FACTORS FOR PVC AND FRP PIPE

<u>Specific Gravity</u>	<u>Correction Factor</u>
2.5	0.80
Air	1.40

3-4. INSTALLATION.

3-4.01. General. All piping shall be supported in a manner which will prevent undue stress on any valve, fitting, or piece of equipment. In addition, pipe supports shall be provided at changes in direction or elevation, and adjacent to flexible couplings. Pipe supports and hangers shall not be installed in equipment access areas.

Where horizontal piping is arranged with two or more parallel lines, trapeze hangers may be used in lieu of individual hangers. Trapeze assembly shall consist of structure attachments as previously specified with rod size dependent upon total weight supported. Spacing of assemblies shall be determined by the minimum pipe size included in the group supported. Trapeze horizontal assemblies shall be structural angle or channel section of sufficient size to prevent measurable sag between rods when pipes are full. All lines shall be attached to the horizontal with intermediate pipe guides and U-bolts or one-hole clamps. Pre-engineered support equipment may be used when selected and installed in accordance with the manufacturer's recommendations.

Where copper pipe is installed on a support system of dissimilar metal with other pipes, the copper pipe shall be galvanically isolated from the support using Neoprene strips or other material acceptable to Engineer.

No piping shall be supported from the pipe above.

Horizontal piping hanger support rods shall attach to steel beams with center-loading I-clamps, or welded beam clips. Hanger support rods shall attach to concrete slabs or beams with inserts.

Anchorage shall be provided to resist both lateral and longitudinal seismic forces.

3-4.02. Inserts. Reference building structural concrete Drawings for concrete inserts. When not provided as part of the building concrete structure, provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.

Where concrete slabs form finished ceilings, provide inserts flush with the slab surface.

Where inserts are omitted, drill through concrete slab from below and provide thru-bolt with recessed square steel plate and nut recessed into and grouted flush with slab. NDE (Non-Destructive Evaluation) shall be used to locate existing reinforcing before drilling.

3-4.03. Pipe Hangers and Supports. Hanger rod sizes for copper pipe and plastic pipe shall be the size of hanger rods for steel pipe. Install hangers to provide a minimum 1/2 inch space between finished covering and adjacent work.

A hanger shall be placed within 18 inches of each horizontal elbow, and on both sides of all piping accessories and valves weighing 20 lbs or more.

Hangers shall have 1-1/2 inches minimum vertical adjustment.

Support horizontal cast iron, ductile iron and no-hub piping systems adjacent to each joint.

Support vertical piping at every floor using riser clamps.

Support riser piping independently of connected horizontal piping.

Hanger and hanger components shall be sized specifically for the pipe size it is to be used on.

3-5. PLACEMENT. The maximum spacing for pipe supports and expansion joints shall be as indicated in Tables 2, 3, 4, and 5.

Rubber hose and flexible tubing shall be provided with continuous angle or channel support.

Unless otherwise indicated on the Drawings or acceptable to Engineer, piping shall be supported approximately 1-1/2 inches out from the face of walls and at least 3 inches below ceilings.

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Section 15180

VALVE AND GATE ACTUATORS

PART 1 - GENERAL

1-1. SCOPE. This section covers furnishing manual and powered valve and gate actuators and accessories as specified herein.

1-2. GENERAL. Equipment provided under this section shall be fabricated and assembled in full conformity with Drawings, specifications, engineering data, instructions, and recommendations of the equipment manufacturer, unless exceptions are noted by Engineer.

Actuators shall be furnished with all necessary parts and accessories indicated on the Drawings, specified, or otherwise required for a complete, properly operating installation and shall be the latest standard products of a manufacturer regularly engaged in the production of actuators.

1-2.01. 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.

1-2.02. Governing Standards. Except as modified or supplemented herein, electric motor actuators shall conform to applicable requirements of ANSI/AWWA C542.

Except as modified or supplemented herein, actuators for butterfly and eccentric plug valves shall conform to the applicable requirements of ANSI/AWWA C504.

Except as modified or supplemented herein, manual actuators for ball valves shall conform to the applicable requirements of ANSI/AWWA C507.

1-2.03. Power Supply. Power supply to electric actuators will be as indicated in the valve and gate schedules.

1-2.04. Marking. Each actuator shall be marked with the manufacturer's name, model number, and the country of origin. An identifying serial number shall be stamped on a corrosion-resistant plate attached to the actuator.

1-2.05. Temporary Number Plates. Each actuator shall be factory tagged or marked to identify the actuator and the applicable valve or gate by number or service as indicated in the valve or gate schedule.

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1-3. SUBMITTALS. Complete drawings, details, and specifications covering the actuators and their appurtenances shall be submitted in accordance with the Greenbook and Whitebook Submittals section. Submittal drawings shall clearly indicate the country of origin of each actuator and its components.

Submittal drawings shall include separate wiring diagrams for each electrically operated or controlled actuator and the electrical control equipment. Each actuator drawing shall be identified with the respective valve number or name.

For networked valve actuators, information on the available input and output assemblies shall be submitted for the protocol(s) identified in the Instrumentation and Controls section, the Control Strategy sections and per the existing MBC DCS system. The submittal shall identify the version of the selected network protocol for which the device has been tested and certified.

For electric or cylinder actuators, certified copies of reports covering proof-of-design testing of the actuators as set forth in Section 5 of ANSI/AWWA C541 or ANSI/AWWA C542 respectively, together with an affidavit of compliance as indicated in Section 6.3 of ANSI/AWWA C541 or ANSI/AWWA C542 respectively, shall be submitted to Engineer before the actuators are shipped.

PART 2 - PRODUCTS

2-1. PERFORMANCE AND DESIGN REQUIREMENTS.

2-1.01. General. Actuators and appurtenances shall be designed for the conditions and requirements as indicated in the respective valve and gate sections.

Liberal factors of safety shall be used throughout the design, especially in the design of parts subject to intermittent or alternating stresses. In general, working stresses shall not exceed one-third of the yield point or one-fifth of the ultimate strength of each material.

2-1.02. Valve Actuators. Each actuator shall be designed to open or close the valve under all operating conditions. Actuators shall be designed for the maximum pressure differential across the valve and maximum velocities through the valve where indicated in the respective valve schedules.

Valve actuators shall be provided and adjusted by the valve manufacturer. Actuator mounting arrangements and positions shall facilitate operation and maintenance and shall be determined by the valve manufacturer unless indicated otherwise on the Drawings or directed by Engineer.

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When valves are to be buried, submerged, or installed in vaults; the actuators and accessories shall be sealed to prevent the entrance of water. The design water depth shall be as indicated in the respective valve schedules but not less than 20 feet .

2-1.03. Gate Actuators. Actuators shall be sized to produce the torque or thrust required to operate the gate when subject to the seating and unseating operating heads as indicated in the respective gate schedules.

Both the design head and the operating head shall be measured from the surface of the liquid to the center line of the gate.

2-1.04. Limit Switches. Limit switches shall be provided as indicated on the Drawings or in the valve and gate schedules.

For manual or cylinder type actuators, each limit switch shall be heavy duty type, with a cast NEMA Type 4 enclosure, a spring return roller lever, and four isolated contacts (two normally open and two normally closed) rated 10 amperes at 120 to 480 volts ac and 5 amperes at 125 volts dc. The switches shall be Allen Bradley "802T" or Square D "9007 Type C".

Limit switches for intelligent and standard electric actuators shall be as indicated in their respective paragraphs.

2-2. MATERIALS. Except as modified or supplemented herein, materials used in the manufacture of actuators shall conform to the requirements of the applicable governing standard(s).

2-3. VALVE MANUAL ACTUATORS.

2-3.01. General. Manual actuators of the types listed in the valve specifications or schedules shall be provided by the valve manufacturer.

Unless otherwise indicated or specified, each geared manual actuator shall be equipped with an operating handwheel.

The direction of rotation of the wheel, wrench nut, or lever to open the valve shall be to the left (counterclockwise). Each valve body or actuator shall have cast thereon the word "Open" and an arrow indicating the direction to open.

The housing of traveling-nut type actuators shall be fitted with a removable cover which shall permit inspection and maintenance of the operating mechanism without removing the actuator from the valve. Travel limiting devices shall be provided inside the actuator for the open and closed positions. Travel limiting stop nuts or collars installed on the reach rod of traveling-nut type operating mechanisms shall be field adjustable and shall be locked in position by means of a removable roll pin, cotter pin, or other positive locking device. The use of stop

nuts or adjustable shaft collars which rely on clamping force or setscrews to prevent rotation of the nut or collar on the reach rod will not be acceptable.

Each actuator shall be designed so that shaft seal leakage cannot enter the actuator housing.

Valves for throttling service shall be equipped with an infinitely variable locking device or a totally enclosed gear actuator.

Actuators shall produce the required torque with a maximum pull of 60 lbs on the lever, handwheel, or chain. Actuator components shall withstand, without damage, a pull of 200 lbs on the handwheel or chainwheel or an input of 300 foot-lbs on the operating nut.

2-3.02. Handwheels. Handwheel diameters shall be at least 8 inches but not more than 24 inches for 30 inch and smaller valves and not more than 30 inches for 36 inch and larger valves.

2-3.03. Chainwheels. Unless otherwise specified in the valve schedules, all valves with center lines more than 7'-6" above the floor shall be provided with chainwheels and operating chains. Each chainwheel operated valve shall be equipped with a chain guide which will permit rapid handling of the operating chain without "gagging" of the wheel and will also permit reasonable side pull on the chain. Suitable extensions shall be provided, if necessary, to prevent interference of the chain with adjacent piping or equipment. Operating chains shall be hot-dip galvanized or zinc plated carbon steel and shall be looped to extend to within 4 feet of the floor below the valve.

2-3.04. Levers. Levers shall be capable of being locked in at least five intermediate positions between fully open and fully closed. In any building or structure containing lever operated valves, at least two operating levers shall be provided for each size and type of lever operated valve.

2-3.05. Chain Levers. Suitable actuator extensions shall be provided, if necessary, to prevent interference of the chain with adjacent piping or equipment. Operating chains shall be hot-dip galvanized carbon steel and shall be looped to extend to within 4 feet of the floor below the valve.

2-3.06. Wrench Nuts. Unless otherwise specified in the valve schedules or on the Drawings, wrench nuts shall be provided on all buried valves and on all valves that are to be operated through floor boxes. Unless otherwise directed by Engineer, all wrench nuts shall comply with Section 4.4.13 of ANSI/AWWA C500. At least two operating keys shall be furnished for operation of the wrench nut operated valves.

2-3.07. Operating Stands. Operating stands shall be provided in the locations indicated on the Drawings or as indicated in the valve and gate schedules. Operating stands shall support the handwheel approximately 36 inches above the floor. A sleeve made from standard weight galvanized steel pipe shall be provided for the opening in the floor beneath each operating stand. When stems are 10 feet or longer, a suitable thrust bearing shall be provided in each operating stand to carry the weight of the extension stem.

2-3.08. Wall Brackets. Wall brackets shall be provided to support manual actuators in the locations indicated on the Drawings or in the respective valve schedules. The horizontal face of the bracket shall be predrilled to accept the actuator and the stem without modification. The top of the bracket shall extend sufficiently to bear on and transfer thrust loads to the top of the supporting structure.

2-4. GATE MANUAL ACTUATORS. Not used.

2-5. INTELLIGENT ELECTRIC ACTUATORS.

2-5.01. General. Intelligent electric actuators as listed in the valve and gate schedules shall be provided by the valve or gate manufacturer.

For Area 60, the actuator installed shall be compatible with the existing Rotork 2-wire PakScan communication system. For Area 80, the actuator installed shall be compatible with the existing Limatorque 2-wire Modbus communication system.

Intelligent electric actuators for Area 60 valves with open-close service shall be multi-turn type and shall be Rotork "ROMPAK Series", without exception.

Intelligent electric actuators with torque output requirements of 750 ft-lbs and less for butterfly valves and eccentric plug valves shall be quarter-turn type and shall be Auma "AUMATIC SGBV 05.1 through SGBV 12.1", EIM "HQ Series", Limatorque "QX" or Rotork "IQT Series" without exception.

All other intelligent electric actuators for open-close service shall be multi-turn type and shall be Auma "AUMATIC AC SABV 07.1 through SABV 16.1", EIM "TEC2000", Limatorque "MX", or Rotork "IQ Series", without exception.

Intelligent electric actuators for modulating service shall be Auma "AUMATIC AC SARBV 07.1 through SARBV 16.1", EIM "TEC2000", Limatorque "MX", or Rotork "IQ Series", without exception.

Intelligent electric actuators for explosion proof service shall be Auma "AUMATIC AC SAExBV/SARExBV 07.1 through SAExBV/SARExBV 16.1", EIM "TEC2000", Limatorque "MX", or Rotork "IQ Series" without exception.

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Intelligent electric actuators produced by other manufacturers are not acceptable.

Intelligent electric actuators shall be capable of non-intrusive configuration without requiring removal of any actuator covers. Configuration of actuator functions shall be by use of a hand held infrared linked device, laptop or PDA with compatible wireless communication capability, or by local control switches and 32-character LCD display mounted on the actuator housing. The display language shall be English .

Intelligent electric actuators shall be provided with the capability to connect to a network over which valve commands and status shall be communicated. The communication protocol shall be Paksan for Area 60 and Modbus for Area 80. The actuator shall have been tested and certified for the latest version of this protocol to insure proper operation with the polling device.

Each intelligent electric actuator shall be furnished complete with a motor, gearing, handwheel, configurable output relays, torque sensors, lubricants, wiring, and terminals. Each actuator shall be constructed as a self-contained unit with a ductile iron or aluminum alloy housing, of a type as indicated in the valve and gate schedules, and shall be integrally assembled on the applicable valve or gate by the valve or gate manufacturer. Housings shall have two O-ring seals, one on the controls compartment and one on the terminal cover.

Actuators shall be designed to cycle the valve or gate from the fully open to the fully closed position or the reverse in approximately 60 seconds or as indicated in the valve and gate schedules.

Actuator motors may be mounted horizontally adjacent to or vertically above the reduction gearing. All gearing shall be oil or grease lubricated.

2-5.02. Motors. Motors shall be totally enclosed, high torque design made expressly for valve and gate actuator service, capable of operating the valve or gate under full differential pressure for two complete strokes or one complete cycle of travel without overheating. Motors shall be designed in accordance with NEMA standards and shall operate successfully at any voltage within 10 percent above or below rated voltage. Motor bearings shall be permanently lubricated. Motors shall be provided with stall, temperature, loss of phase, and reverse phase protection. Actuators shall be capable of indicating phase loss.

2-5.03. Power Gearing. Power gearing shall consist of hardened steel spur or helical gears and alloy bronze or hardened steel worm gear, all suitably lubricated, designed for 100 percent overload, and effectively sealed against entrance of foreign matter. Steel gears shall be hardened to at least 350 Brinell. Planetary or cycloidal gearing, aluminum, mild steel, or nonmetallic gears will not be acceptable. Gearing shall be designed to be self-locking so that actuation of

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a torque switch or electronic torque protection device by a torque overload condition will not allow the actuator to restart until the torque overload has been eliminated. If a secondary gearbox is required, it shall be designed to withstand the locked rotor torque of the actuator.

2-5.04. Handwheel Mechanism. The handwheel shall not rotate during motor operation. During handwheel operation the motor shall not affect the actuator operation. The actuator shall be responsive to electrical power and control at all times and, when under electrical control, shall instantly disengage the handwheel. The handwheel shall rotate counterclockwise to open the valve. An arrow indicating the opening direction and the word "Open" shall be cast on the handwheel. The force required to operate the handwheel shall not exceed 60 lbs. The handwheel shall have a padlockable declutch lever.

2-5.05. Torque Sensing. Torque and thrust loads in both closing and opening directions shall be limited by a torque sensing device. Torque settings shall be adjustable and shall be indicated locally. The adjustment shall permit a variation of 40 to 100 percent of rated torque.

2-5.06. Terminal Facilities. Terminal facilities for connection to motor leads, switches, and control and indication signals shall be provided in a readily accessible terminal compartment. The terminal compartment shall have at least two openings for external electrical conduits, one sized at least 3/4 inch and the other at least 1-1/4 inches. Each terminal compartment shall be large enough to allow easy routing and termination of fifteen 12 AWG conductors.

2-5.07. Controls Compartment. Each actuator shall be furnished with a sealed compartment containing a reversing controller, multi tap transformer, electronic controls, and monitoring and protection modules. Reversing controllers shall be both mechanically and electrically interlocked and provided with the necessary direct-operated auxiliary contacts for required interlocking and control. The multi tap transformer shall provide power for all internal circuits, and shall provide 120 VAC supply for remote controls as indicated in the valve and gate schedules, or in the schematics on the Drawings.

Where not networked, actuators for valves or gates listed for modulating service in the valve and gate schedules shall be provided with a control module for position modulating type service. The control module shall be mounted within the controls compartment. The module shall accept a standard 4-20 mA dc analog input signal with a load impedance of not greater than 400 ohms. The control module shall contain adjustments for span, zero, gain, and deadband. Non-networked modulating actuators shall have a 4 to 20 mA output signal proportional to valve or gate position.

2-5.08. Local Controls. Each actuator shall have controller devices mounted on the actuator as indicated in the valve and gate schedules.

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2-5.09. Remote Indication and Controls. Valve or gate position and actuator status indication for non-networked valves shall be provided by four configurable output relay contacts which can be selected to indicate any position of the valve or gate. Relays shall be configurable to the normally open or normally closed states. Relays shall maintain and update position indication during handwheel operation. Contacts shall be rated 5 A, 250 VAC, 30 VDC. When not used for position indication, any of the four configurable relays shall be selectable to signal one of the following:

- Valve or gate opening, closing, or moving.
- Thermostat tripped, phase loss.
- Motor tripped on torque in mid travel, motor stalled.
- Remote mode selected.
- Local mode selected.

Valve or gate control commands and actuator status indication for networked valves shall be communicated over the network. The actuator shall accept remote controls through the network to open, close, and stop the actuator and shall also accept a position setpoint. Hardwired signals to the actuator shall prevent or allow the actuator to operate as indicated on the Drawings. A hardwired permissive, inhibit or emergency stop interlock(s) shall override commands transmitted through the network.

At a minimum, the actuator shall transmit the following status information through network:

- Valve opening, closing, or moving.
- Valve full open, full closed.
- Thermostat tripped, phase loss.
- Motor tripped on torque in mid travel, motor stalled.
- Remote mode selected.
- Local mode selected.
- Valve position.
- Valve torque.

2-5.10. Remote Electric Actuator Control Station. Each actuator shall be furnished with a remote control station as indicated in the valve schedules and on the Drawings. The control station shall include red and green indicating lights for valve position status, and Local-Off-Remote and Open-Close selector switches for control.

Power for the remote control station shall be provided from its respective actuator unit. The remote control station shall be rated NEMA 4X. Each device mounted on the remote control station shall have an engraved label or escutcheon plate indicating its respective function. The remote control station shall have an

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engraved tag indicating the tag number or description of the respective actuated valve or gate.

2-6. STANDARD ELECTRIC ACTUATORS. Not used.

2-7. HYDRAULIC CYLINDER ACTUATORS. Not used.

2-8. AIR CYLINDER ACTUATORS. Not used.

2-9. VANE TYPE PNEUMATIC ACTUATORS. Not used.

2-10. AIR-OIL CYLINDER ACTUATORS. Not used.

2-11. PORTABLE ELECTRIC ACTUATORS. Not used.

2-12. PORTABLE HYDRAULIC ACTUATORS. Not used.

2-13. ACTUATOR ACCESSORIES.

2-13.01. Extension Stems. Extension stems and stem guides shall be furnished when indicated in the respective valve schedules, indicated on the Drawings, or otherwise required for proper valve operation. Extension stems shall be of solid steel and shall be not smaller in diameter than the stem of the actuator shaft. Extension stems shall be connected to the actuator with a single Lovejoy "Type D" universal joint with grease-filled protective boot. All stem connections shall be pinned.

At least two stem guides shall be furnished with each extension stem, except for buried valves. Stem guides shall be of cast iron, bronze bushed, and adjustable in two directions. Stem guide spacing shall not exceed 100 times the stem diameter or 10 feet, whichever is smaller. The top stem guide shall be designed to carry the weight of the extension stem. The extension stem shall be provided with a collar pinned to the stem and bearing against the stem thrust guide.

Extension stems for chemical resistant butterfly valves located in drainage sumps or containment basins shall be the two-piece type with stainless steel stem, PVC housing, wall support, and collar. Unless otherwise indicated on the Drawings, the length of the stem extension shall be as necessary to position the valve operator 12 inches above the maximum liquid level in the immediate area.

Extension stems for buried valve actuators shall extend to within 6 inches of the ground surface, shall be centered in the valve box using spacers, and shall be equipped with a wrench nut.

Extension stems for buried valve actuators shall be provided with position indicators as specified in the valve schedules.

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Torque tube and bonnet extensions shall be provided for the existing polymer storage tank outlet butterfly valve actuators such that the actuator assembly and manual handwheel are raised to a height above the catwalk handrailing, as well specified heights in the valve schedule on the drawings. Contractor shall provide all bracketing and bracing required and recommended by the manufacturer. Torque tube and bonnet extensions provided shall be compatible with the existing butterfly valve (Asahi/America PVC) and actuator (Rotork Q300)

Contractor shall install hand wheel extensions for the existing diaphragm valve limit switch handwheels in the Area 60 tank farm as indicated in the drawings such that the valve can be manually opened/closed via handwheel at a height above the catwalk handrailing, and as specified in the valve schedule on the drawings. Contractor shall provide all bracketing and bracing required and recommended by the manufacturer. Handwheel extensions provided shall be compatible with the existing diaphragm valve and limit switch (Saunders – Alfa/Laval).

2-13.02. Position Indicators. Unless otherwise specified, each valve actuator shall be provided with a position indicator to display the position of the plug or disc relative to the body seat opening.

For quarter turn plug, ball, or cone type valves installed in interior locations, the indicating pointer shall be mounted on the outer end of the valve operating shaft extension and shall operate over an indicating scale on the operating mechanism cover. Where the shaft passes through the cover, a suitable stuffing box or other seal shall be provided to prevent the entrance of water.

Each actuator for butterfly valves, except where located in manholes, buried, or submerged, shall have a valve disc position indicator mounted on the end of the valve shaft. A disc position indicator shall also be provided on each operating stand or the actuator mounted thereon.

2-13.02.01. Position Indicators for Buried Actuators. Not used.

2-13.03. Floor Boxes. Openings through concrete slabs provided for key operation of valves shall be provided with a cast iron floor box complete with cover. The floor box shall be of the depth indicated on the Drawings. Where the operating nut is in the slab, the stem shall have a guide to maintain the nut in the center of the box; where the nut is below the slab, the opening in the bottom of the box shall accommodate the operating key.

Each floor box and cover shall be shop coated with manufacturer's standard coating.

2-13.04. Torque Tubes. Torque tube shall utilize pipe rather than solid shafting between the valve input shaft and the output shaft of the valve floorstand operator. An adjustment of 2 inches shall be provided in the torque tube installation. Torque tube shall be coated with the same material as the submerged valve.

2-13.05. Valve Boxes. Not used.

2-14. SHOP PAINTING. All ferrous metal surfaces, except bearing and finished surfaces and stainless steel components of valve actuators and accessories, shall be shop painted for corrosion protection. The valve manufacturer's standard coating will be acceptable, provided it is functionally equivalent to the specified coating and is compatible with the specified field painting.

The following surfaces shall be painted:

Polished or Machined Surfaces	Rust-preventive compound.
Other Surfaces	Epoxy.
Actuators and Accessories	Universal primer.

PART 3 - EXECUTION

3-1. INSTALLATION. Actuators will be installed on the valves and gates in accordance with the valve and gate individual equipment specification section.

3-2. NETWORK SETUP. A manufacturer's representative for the intelligent electric actuator manufacturer shall inspect all network terminations for conformity with the manufacturer's recommended methods of terminating the network to each actuator, and shall notify the Contractor of any wiring modifications required. The manufacturer's representative shall also set addresses for each valve and prove communication over the network. The valve manufacturer shall furnish the required information to the control system supplier that will allow the specified control and monitoring for each intelligent electric actuator.

The Contractor shall coordinate these activities between the actuator manufacturer and the control system supplier.

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Section 16050

ELECTRICAL

PART 1 - GENERAL

1-1. SCOPE. This section covers the furnishing and installation of all equipment and materials needed for the electrical requirements of this Contract.

This section covers the installation and interconnection of electrical equipment furnished under other sections, except electrical items designated to be installed under those sections.

1-2. GENERAL. Electrical apparatus on all equipment shall be installed complete and placed in readiness for proper operation.

Electrical 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 equipment manufacturer, unless exceptions are noted by Engineer.

1-2.01. General Equipment Stipulations. The General Equipment Stipulations section shall apply to all equipment provided under this section. If requirements in this section differ from those in the General Equipment Stipulations section, the requirements specified herein shall take precedence

1-2.02. Seismic Design Requirements. Seismic design requirements for products specified herein shall be as indicated in the Meteorological and Seismic Design Criteria section.

1-2.03. Coordination. Electrical work shall conform to the construction schedule and the progress of other trades.

1-2.04. Anchor Bolts and Expansion Anchors. All anchor bolts, nuts, washers, and expansion anchors shall comply with Anchorage in Concrete and Masonry section, except smaller than 3/4 inch will be permitted to match NEMA standard size bolt holes on motors and electrical equipment.

1-2.05. Drawings. Supplementing this section, the Drawings indicate locations of equipment and enclosures and provide one-line and schematic diagrams regarding the connection and interaction with other equipment.

1-3. CODES AND PERMITS. All work shall be performed and materials shall be furnished in accordance with the NEC - National Electrical Code, the NESC - National Electrical Safety Code, and the following standards where applicable:

ANSI	American National Standards Institute.
ASTM	American Society for Testing and Materials.
AWG	American Wire Gauge.
Fed Spec	Federal Specification.
ICEA	Insulated Cable Engineers Association.
IEEE	Institute of Electrical and Electronics Engineers.
IESNA	Illuminating Engineering Society of North America.
NEIS	National Electrical Installation Standards
NEMA	National Electrical Manufacturers Association.
NFPA	National Fire Protection Association.
UL	Underwriters' Laboratories.

Equipment covered by this section shall be listed by UL, or by a nationally recognized third party testing laboratory. All costs associated with obtaining the listing shall be the responsibility of Contractor. If no third-party testing laboratory provides the required listing, an independent test shall be performed at Contractor's expense. Before the test is conducted, Contractor shall submit a copy of the testing procedure to be used.

1-4. SEISMIC DESIGN REQUIREMENT.

1-4.01. Seismic Design Requirements. Submit confirmation of compliance with the requirements of the Meteorological and Seismic Design Criteria section.

1-5. IDENTIFICATION.

1-5.01. Conduit. Conduits in manholes, handholes, building entrance pull boxes, junction boxes, and equipment shall be provided with identification tags. Identification tags shall be 19 gage stainless steel, with 1/2 inch stamped letters and numbers as indicated on the Drawings. Identification tags shall be attached to conduits with nylon tie wraps and shall be positioned to be readily visible.

1-5.02. Conductors. All conductors in power, control, and instrumentation circuits shall be identified and color coded as described herein.

1-5.02.01. Conductor Identification Number. Except for lighting and receptacle circuits, each individual conductor in power, control, and instrumentation circuits shall be provided with wire identification markers at the point of termination.

The wire markers shall be of the heat-shrinkable tube type, with custom typed identification numbers.

The wire numbers shall be as indicated on the equipment manufacturer's drawings.

The wire markers shall be positioned to be readily visible for inspection.

1-5.02.02. Conductor Color Coding. Power conductors shall be color coded as indicated below. For conductors 6 AWG and smaller, the color coding shall be the insulation finish color. For sizes larger than 6 AWG, the color coding may be by marking tape. The equipment grounding conductor shall be green or green with one or more yellow stripes if the conductor is insulated.

The following color coding system shall be used:

120/240V single-phase — black, red, and white
120/208V, three-phase — black, red, blue, and white
120/240V, three-phase — black, orange, blue, and white
277/480V, three-phase — brown, orange, yellow, and gray

Where 120/240 and 120/208 volt systems share the same conduit or enclosure, the neutral for either the 120/240 volt system or the 208 volt system shall be white with a permanent identifiable violet stripe.

Control and instrumentation circuit conductors shall be color coded as indicated in the Cable Data Figures at the end of this section.

1-5.03. Motor Starters. Motor starters shall be provided with nameplates identifying the related equipment. Pilot controls and indicating lights shall have engraved or etched legends ("start", "stop", etc.) as indicated on the Drawings. Nameplates shall be laminated black-over-white plastic, with 1/8 inch engraved letters, and shall be securely fastened to the motor starters.

1-5.04. Control Stations. Control stations shall be provided with nameplates identifying the related equipment. Pilot controls and indicating lights shall have engraved or etched legends ("start", "stop", etc.) as indicated on the Drawings. Nameplates shall be laminated black-over-white plastic, with 1/8 inch engraved letters, and shall be securely fastened to the control stations.

1-5.05. Circuit Breakers. Not used.

1-5.06. Disconnect Switches. All switches shall have front cover-mounted permanent nameplates that include switch type, manufacturer's name and catalog number, and horsepower rating. An additional nameplate, engraved or

etched, laminated black-over-white plastic, with 1/8 inch letters, shall be provided to identify the associated equipment. Both nameplates shall be securely fastened to the enclosure.

1-5.07. Arc Flash Hazard Labels. Lighting panels, power panels, power centers, and meter socket enclosures shall be provided with permanent labels warning the risk of arc flash and shock hazard. Labels shall be designed in accordance with ANSI Z535.4-1998 and shall include the following:

WARNING
Arc Flash and Shock Hazard

Appropriate personal protection equipment (PPE) required. SEE NFPA 70E.
Equipment must be accessed by qualified personnel only.
Turn off all power sources prior to working on or inside equipment.

1-6. SUBMITTALS. Complete assembly, foundation, and installation drawings, together with complete engineering data covering the materials used, parts, devices, and accessories forming a part of the work performed by the Contractor, shall be submitted in accordance with the Greenbook and Whitebook Submittals section. The drawings and data shall include, but shall not be limited to, the following:

Drawings and data.
Operating manuals.
Samples.

1-6.01. Submittal Identification. Information covering all materials and equipment shall be submitted for review in accordance with the Greenbook Submittals section. Each sheet of descriptive literature submitted shall be clearly marked to identify the material or equipment as follows:

- a. Lamp fixture descriptive sheets shall show the fixture schedule letter, number, or symbol for which the sheet applies.
- b. Equipment and materials descriptive literature and drawings shall show the specification paragraph for which the equipment applies.
- c. Sheets or drawings covering more than the item being considered shall have all inapplicable information crossed out.
- d. A suitable notation shall identify equipment and materials descriptive literature not readily cross-referenced with the Drawings or Specifications.

- e. Schematics and connection diagrams for all electrical equipment shall be submitted for review. A manufacturer's standard connection diagram or schematic showing more than one scheme of connection will not be accepted, unless it is clearly marked to show the intended connections.

Contractor shall submit the name and qualifications of the Engineering and Testing Services firm proposed to perform the coordination study and the on site testing.

Within 90 days after the Notice to Proceed, Contractor shall furnish a submittal for all types of cable and conduit to be provided. The submittal shall include the cable manufacturer and type, and sufficient data to indicate that the cable and conduit meet the specified requirements.

In addition to the complete specifications and descriptive literature, a sample of the largest size of each type of cable shall be submitted for review before installation. Each sample shall include legible and complete surface printing of the cable identification.

1-7. PROTECTION AND STORAGE. During construction, the insulation on all electrical equipment shall be protected against absorption of moisture, and metallic components shall be protected against corrosion by strip heaters, lamps, or other suitable means. This protection shall be provided immediately upon receipt of the equipment and shall be maintained continuously.

PART 2 - PRODUCTS

2-1. POWER SERVICE ENTRANCE. Not used.

2-2. TELEPHONE SERVICE ENTRANCE. Not used.

2-3. CABLE. All cables of each type (such as lighting cable or 600 volt power cable) shall be from the same manufacturer.

All types of cable shall conform to the Cable Data Figures at the end of this section and as described herein.

2-3.01. Lighting Cable. Lighting cable (Figure 1-16050 THHN-THWN) shall be provided only in lighting and receptacle circuits operating at 277 volts or less. Lighting and receptacle circuits, 8 AWG or larger, shall be as specified for 600 volt (Figure 2-16050 XHHW) power cable.

2-3.02. 600 Volt Power Cable. Cable in power, control, indication, and alarm circuits operating at 600 volts or less, except where lighting, multiconductor

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control, and instrument cables are required, shall be 600 volt (Figure 2-16050 XHHW-2) power cable.

2-3.03. Instrument Cable. Cable for electronic circuits to instrumentation, metering, and other signaling and control equipment shall be two- or three-conductor instrument cable twisted for magnetic noise rejection and protected from electrostatic noise by a total coverage shield. Types of instrument cables shall be (Figure 4-16050 single pair).

2.3.04. Multiconductor Control Cable. Not used.

2-3.05. Medium Voltage Power Cable. Not used.

2-3.06. Tray Cable. Not used.

2-4. CONDUIT. Conduit and raceways shall be as described in the following paragraphs:

2-4.01. Rigid Steel Conduit. Rigid steel conduit shall be heavy wall, hot-dip galvanized, shall conform to ANSI C80.1, and shall be manufactured in accordance with UL 6.

2-4.02. Intermediate Metal Conduit (IMC). Not used.

2-4.03. Liquidtight Flexible Metal Conduit. Liquidtight flexible metal conduit shall be hot-dip galvanized steel, shall be covered with a moistureproof polyvinyl chloride jacket, and shall be UL labeled.

2-4.04. Utility (PVC) Duct. Not used.

2-4.05. Rigid Nonmetallic (PVC) Conduit. Not used.

2-4.06. PVC-Coated Rigid Steel Conduit. The conduit shall be rigid steel. Before the PVC coating is applied, the hot-dip galvanized surfaces shall be coated with a primer to obtain a bond between the steel substrate and the coating. The PVC coating shall be bonded to the primed outer surface of the conduit. The bond on conduit and fittings shall be stronger than the tensile strength of the PVC coating. The thickness of the PVC coating shall be at least 40 mils .

A chemically cured two-part urethane coating, at a nominal 2 mil thickness, shall be applied to the interior of all conduit and fittings. The coating shall be sufficiently flexible to permit field bending the conduit without cracking or flaking of the coating.

Every female conduit opening shall have a PVC sleeve extending one conduit diameter or 2 inches , whichever is less, beyond the opening. The inside diameter of the sleeve shall be the same as the outside diameter of the conduit before coating. The wall thickness of the sleeve shall be at least 40 mils .

All fittings, condulets, mounting hardware, and accessories shall be PVC-coated. All hollow conduit fittings shall be coated with the interior urethane coating described above. The screw heads on condulets shall be encapsulated by the manufacturer with a corrosion-resistant material.

PVC coated rigid steel conduit shall be manufactured by Ocal, Perma-Cote, or Robroy.

2-4.07. Electrical Metallic Tubing (EMT). Not used.

2-4.08. Rigid Aluminum Conduit (RAC). Not used.

2-5. WIRING DEVICES, BOXES, AND FITTINGS. Concealed conduit systems shall have flush-mounted switches and convenience outlets. Exposed conduit systems shall have surface-mounted switches and convenience outlets.

2-5.01. Conduit Boxes and Fittings.

- a. Galvanized or cadmium plated, threaded, malleable iron boxes and fittings shall be manufactured by Crouse-Hinds, Appleton, or O Z Gedney. In applications utilizing aluminum conduit systems, aluminum boxes and fittings manufactured by Crouse-Hinds, Appleton, or O Z Gedney shall be installed.
- b. Rigid PVC device boxes and fittings shall be manufactured by Carlon or Cantex.
- c. Sheet steel device boxes shall be manufactured by Appleton, Raco, or Steel City.
- d. PVC coated device boxes shall be manufactured by Ocal, Perma-Cote, or Robroy Industries.
- e. Hub arrangements on threaded fittings shall be the most appropriate for the conduit arrangement to avoid unnecessary bends and fittings.

2-5.02. Device Plates.

- a. Galvanized or cadmium-plated device plates shall be used on surface mounted outlet boxes where weatherproof plates are not required.

- b. Device plates on flush mounted outlet boxes where weatherproof plates are not required shall be AISI Type 302 stainless steel, Eagle "93nnn series", Hubbell "S series", or Leviton "840nn-40 series"; nylon or polycarbonate, Eagle "513nV series", Hubbell "Pn series", or Leviton "807nn-I series".
- c. Device plate mounting hardware shall be countersunk and finished to match the plate.
- d. Device plates for switches outdoors or indicated as weatherproof shall have provisions for padlocking switches "On" and "Off", and shall be Appleton "FSK-1VS", Crouse-Hinds "DS185" or O Z Gedney "FS-1-WSCA".
- e. Device plates for receptacles indicated as weatherproof shall be Appleton "FSK-WRD", Crouse-Hinds "WLRD1", or O Z Gedney "FS-1-WDCA".
- f. Flush-mounted, weatherproof plates shall be provided with adapter plates, Appleton "FSK-SBA" or Crouse-Hinds "FS031".
- g. Device plates for ground fault interrupter receptacles indicated to be weatherproof shall be Appleton "FSK-WGF1", Eagle "966", or O Z Gedney "FS-1-GFCA".
- h. Receptacle covers outdoors or otherwise indicated to be weatherproof while in-use shall be die cast aluminum and shall include a padlock eye. Covers for standard convenience outlets shall be Hubbell "WP8M" or Thomas and Betts Red Dot "CKMUV". Covers for ground fault interrupter receptacles shall be Hubbell "WP26M" or Thomas and Betts Red Dot "CKMUV".
- i. Engraved device plates, where required, shall be manufactured by Leviton, or equal.
- j. Device plates on PVC conduit fittings shall be Carlon "E98 Series" or Cantex "513300 Series".

2-5.03. Wall Switches.

- a. Switches on ac lighting panel load circuits through 277 volts shall be 20 amperes, 120/277 volts, Eagle "2221V" through "2224V", Hubbell "HBL 1221I" through "HBL 1224I", or Leviton "1221-2I" through "1224-2I".
- b. Switches for pulse control of lighting contactors shall be 20 amperes, 120/277 volts, momentary, double-throw, center "Off", Eagle "2220V", Hubbell "1557I" or Leviton "1257-I".
- c. Switches on ac lighting panel load circuits through 277 volts in Class I, Division 1 and Division 2, Group D hazardous areas indicated on the Drawings shall be 20 ampere, 120/277 volts. Hazardous area

switches shall be factory sealed tumbler switches, Appleton "EDS" or Killark "FXS".

2-5.04. Receptacles.

- a. Standard convenience outlets shall be duplex, three-wire, grounding, 20 amperes, 125 volts, Eagle "5362V", Hubbell "5362I" or Leviton "5362-I" for 120 volt circuits, and 250 volts, Eagle "5462V", Hubbell "5462I" or Leviton "5462-I" for 240 volt circuits.
- b. Ground fault circuit interrupter receptacles shall be duplex, 20 amperes, 125 volts, Eagle "GF8300V", Hubbell "GF5362I" or Leviton "7899-I".
- c. Welding receptacles shall be 30 amperes, 600 volts, 3 phase, with grounding conductors connected through a fourth pole, Appleton "ACRE3034-100", Crouse-Hinds "AR348" plus "ARRC33" and "AR30" or Leviton "430MI5W". One matching plug, Appleton "ACP3034BC", Crouse-Hinds "APJ3485" or Leviton "430P5W" with appropriate woven grip and plug cap, shall be furnished for the cable size directed by Engineer.
- d. Welding receptacles shall be 60 amperes, 240 volts, 3 phase, with grounding conductors connected through a fourth pole, Appleton "ACRE6035-150", Crouse-Hinds "AREA6485" or Leviton "460MI9W". One matching plug, Appleton "ACP6034BC", Crouse-Hinds "APJ6485" or Leviton "460P9W" with appropriate woven grip and plug cap, shall be furnished for the cable size directed by Engineer.
- e. Receptacles in Class I, Division 1 and Division 2, Group D hazardous areas indicated on the Drawings shall be three-wire, grounding, 20 amperes, 125 volts. Hazardous area receptacles shall be factory sealed, with an integral switch that is only activated when an approved matching plug is fully inserted and rotated into the engaged position. Hazardous area receptacles shall be Appleton "ENR", Crouse-Hinds "ENR", or Killark "UGR".

2-5.05. Special Outlets. Not used.

2-6. JUNCTION BOXES, PULL BOXES, AND WIRING GUTTERS. Indoor boxes (larger than switch, receptacle, or fixture type) and gutters shall be constructed of sheet steel, shall be galvanized after fabrication, and shall be rigidly supported by hot-dip galvanized hardware and framing materials, including nuts and bolts.

Indoor boxes and gutters in corrosive areas and wet locations indicated on the Drawings and outdoor boxes and gutters shall be NEMA Type 4X, ABS and shall

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be rigidly supported by PVC-coated or stainless steel framing materials. Mounting hardware, which includes nuts, bolts, and anchors, shall be stainless steel. All damaged coatings shall be repaired according to the manufacturer's instructions.

Bolt-on junction box covers 3 feet square or larger, or heavier than 25 lbs , shall have rigid handles. Covers larger than 3 by 4 feet shall be split.

Where indicated on the Drawings, junction and pull boxes with a removable side opposite the underground conduits shall be provided over building ends of underground conduit banks. Boxes shall be sized in accordance with the National Electrical Code, including space for full size continuations of all underground conduits not originally continued. Conduit arrangement shall leave maximum space for future conduits.

2-7. LIGHTING FIXTURES. Lighting fixtures shall be furnished as described in the fixture schedule and as indicated on the Drawings. Lighting fixtures shall be furnished complete with lamps. Pendant fixtures shall have swivel type box covers and threaded conduit pendants unless otherwise specified. Lighting fixtures shall be provided with disconnects in accordance with NEC requirements.

2-7.01. Electronic Ballasts. Electronic ballasts furnished with fluorescent type lighting fixtures shall be CBM certified as meeting requirements of ANSI C82.11 with a THD level of not more than 20 percent.

2-8. LIGHTING PANELS. Not used.

2-9. POWER PANELS. Not used

2-10. SURGE PROTECTIVE DEVICES. Not used.

2-11. MOTOR STARTERS. Motor starters, unless otherwise specified, shall be full voltage, magnetic, nonreversing and NEMA rated. The starter enclosures shall have NEMA type designations appropriate for the locations where they will be installed or fit within the allocated bucket space of the motor control center as shown on the drawings.

One thermal overload relay shall be provided in each phase lead. Each starter shall be provided with an external, manually reset push button for resetting the thermal overload relays.

Each starter shall include auxiliary contacts as required, plus one spare NO and one spare NC contact.

Contractor shall match the sizes of control power transformers, overload devices, heaters, and starters to the equipment furnished, as they may differ from the values indicated on the Drawings. Control power transformers shall have both primary leads fused, one secondary lead fused, and one secondary lead grounded.

All starters shall be provided with control terminal blocks. Terminal blocks shall be pull-apart type rated 20 amperes. All current carrying parts shall be tin-plated. The removable portion of the terminal blocks shall be used for factory installed wiring.

All push buttons, selector switches, and pilot lights indicated on the schematics to be provided on or in the starter enclosure shall be 30.5 mm heavy-duty, oiltight construction. Pilot lights shall be full voltage type with LED lamps. Push buttons on starters located outdoors shall be provided with protective caps.

2-11.01. Three Phase Starters. Three phase starters shall be circuit breaker combination type consisting of 3 phase, 60 Hz contactors with thermal overloads, a 120 volt ac coil, a dry type control power transformer where required, and a circuit breaker disconnect. Control power transformers shall be sized to handle all simultaneous loads. Starters shall be at least NEMA Size 1, or shall be sized as indicated on the Drawings.

Circuit breakers shall be 600 volt magnetic motor circuit protectors for motors smaller than 100 horsepower and 600 volt thermal-magnetic type for 100 horsepower and larger motors. Each breaker shall be manually operated with a quick-make, quick-break, trip-free toggle mechanism.

Three phase starters shall be furnished with external manual breaker operating handles and provisions for up to three padlocks. The access door shall be interlocked with the motor circuit protector, so that the door cannot be opened, except by an interlock override, while the breaker is closed.

The complete 3 phase starter shall have an interrupting rating equal to the motor control center amperes.

2-12. SEPARATELY ENCLOSED MANUAL STARTERS. Not used.

2-13. CONTROL STATIONS. Control stations shall be provided as indicated on the one-line diagrams or schematics or as required by the equipment furnished. Pilot devices shall be 30.5 mm heavy-duty, oiltight construction, and shall perform the functions indicated. Pilot lights shall be full voltage type with LED lamps. Indoor control stations shall have NEMA Type 13 enclosures. Control stations outdoors or indicated to be weatherproof shall have NEMA Type 4X stainless steel enclosures with protective caps on the control devices. Control stations in NEC Class I, Division 1 and Division 2, Group D hazardous areas

shall have NEMA Type 7 enclosures, or be factory sealed type, Appleton "Contender Series" or Killark "Seal-X Series".

2-14. SEPARATELY ENCLOSED CIRCUIT BREAKERS. Not used.

2-15. DISCONNECT SWITCHES. Unless otherwise specified, each disconnect switch shall be 3 pole, nonfusible, 600 volts, with a continuous current rating as indicated on the Drawings.

Switches located indoors shall have NEMA type enclosure designations as required by the locations where they will be installed. Switches located outdoors shall have NEMA Type 4X enclosures. Switches in chlorine rooms, or in other areas where contact with caustic substances may occur, shall have NEMA Type 4X enclosures of molded reinforced polyester.

Switches shall have high conductivity copper, visible blades; nonteasible, positive, quick-make, quick-break mechanisms; and switch assembly plus operating handle as an integral part of the enclosure base. Each switch shall have a handle whose position is easily recognizable and which can be locked in the "Off" position with three padlocks. The "On" and "Off" positions shall be clearly marked.

All switches shall be UL listed and horsepower rated, and shall meet the latest edition of NEMA KS1. Switches shall have defeatable door interlocks that prevent the door from being opened while the operating handle is in the "On" position.

2-16. LIGHTING AND AUXILIARY POWER TRANSFORMERS. Not used.

2-17. POWER CENTERS. Not used.

2-18. POWER FACTOR CORRECTION CAPACITORS. Not used.

2-19. LIGHTING CONTACTORS. Not used.

2-20. PHOTOELECTRIC CONTROLS. Not used.

2-21. RELAY ENCLOSURES. Not used.

2-22. ALARM HORN AND BEACON. Not used.

2-23. HEAT-TRACED PIPING. Not used.

PART 3 - EXECUTION

3-1. INSTALLATION, TESTING, AND COMMISSIONING. All material, equipment, and components specified herein shall be installed, tested, and commissioned for operation in compliance with NECA 1000 – NEIS Specification System. Where required in NECA 1000, testing and commissioning procedures shall be followed prior to energizing equipment.

3-2. ARC FLASH HAZARD ANALYSIS. Not used.

3-3. COORDINATION STUDY. Not used.

3-4. POWER AND SERVICE ENTRANCE INSTALLATION. Not used.

3-5. TELEPHONE SERVICE ENTRANCE INSTALLATION. Not used.

3-6. CABLE INSTALLATION.

3-6.01. General. Except as otherwise specified or indicated on the Drawings, cable shall be installed according to the following procedures, taking care to protect the cable and to avoid kinking the conductors, cutting or puncturing the jacket, contamination by oil or grease, or any other damage. Circuits to supply electric power and control to equipment and devices, communication and signal circuits as indicated on the one-line diagrams shall be installed continuous and may not be spliced unless approved by the Engineer.

- a. Stranded conductor cable shall be terminated by lugs or pressure type connectors. Wrapping stranded cables around screw type terminals is not acceptable.
- b. Stranded conductor cable shall be spliced by crimp type connectors. Twist-on wire connectors may be used for splicing solid cable and for terminations at lighting fixtures.
- c. Splices may be made only at readily accessible locations.
- d. Cable terminations and splices shall be made as recommended by the cable manufacturer for the particular cable and service conditions. All shielded cable stress cone terminations shall be IEEE Class 1 molded rubber type. Shielded cable splices shall be tape or molded rubber type as required. Shielded cable splices and stress cone terminations shall be made by qualified splicers. Materials shall be by 3M Company, Plymouth/Bishop, or Raychem Electric Power Products.
- e. Cable shall not be pulled tight against bushings nor pressed heavily against enclosures.

- f. Cable-pulling lubricant shall be compatible with all cable jackets; shall not contain wax, grease, or silicone; and shall be Polywater "Type J".
- g. Cables operating at more than 2000 volts shall be fireproofed in all cable vaults, manholes, and handholes. Fireproofing shall be applied with a half-lapped layer of 3M "Scotch 77 Arc-Proofing Tape", anchored at each end with a double wrap of 3M "Scotch 69 Glass Cloth Tape" or with equivalent tape by Anixter or Plymouth/Bishop.
- h. Where necessary to prevent heavy loading on cable connections, in vertical risers, the cable shall be supported by Kellems, or equal, woven grips.
- i. Spare cable ends shall be taped, coiled, and identified.
- j. Cables shall not be bent to a radius less than the minimum recommended by the manufacturer. For cables rated higher than 600 volts, the minimum radius shall be 8 diameters for nonshielded cable and 12 diameters for shielded cable.
- k. All cables in one conduit, over 1 foot long, or with any bends, shall be pulled in or out simultaneously.
- l. Circuits to supply electric power and control to equipment and devices are indicated on the one-line diagrams. Conductors in designated numbers and sizes shall be installed in conduit of designated size. Circuits shall not be combined to reduce conduit requirements unless acceptable to Engineer.

3-6.02. Underground Cable Pulling Procedure. Not used.

3-6.03. Cable Insulation Test. Not used.

3-7. CONDUIT INSTALLATION. Contractor shall be responsible for routing all conduits. This shall include all conduits indicated on the one-lines, riser diagrams, and home-runs shown on the plan Drawings. Conduits shall be routed as defined in these Specifications. Where conduit routing is shown on plans, it shall be considered a general guideline and shall be field verified to avoid interferences.

Except as otherwise specified or indicated on the Drawings, conduit installation and identification shall be completed according to the following procedures.

3-7.01. Installation of Interior and Exposed Exterior Conduit. This section covers the installation of conduit inside structures, above and below grade, and in exposed outdoor locations. In general, conduit inside structures shall be concealed. Large conduit and conduit stubs may be exposed unless otherwise

specified or indicated on the Drawings. No conduit shall be exposed in water chambers unless so indicated on the Drawings.

Unless otherwise indicated on the Drawings, Contractor shall be responsible for routing the conduit to meet the following installation requirements:

- a. Conduit installed in all exposed indoor locations, except corrosive areas and wet areas indicated on the Drawings, and in floor slabs, walls, and ceilings of hazardous (classified) locations, shall be rigid steel. Exposed conduit shall be rigidly supported by hot-dip galvanized hardware and framing materials, including nuts and bolts.
- b. Conduit installed in floor slabs and walls in non-hazardous locations shall be rigid Schedule 40 PVC.
- c. Conduit installed in all exposed outdoor and wet indoor locations shall be PVC-coated rigid steel, rigidly supported by PVC-coated framing materials. Mounting hardware, which includes nuts, bolts, and anchors, shall be stainless steel. All damaged coatings shall be repaired according to the manufacturer's instructions.
- d. Final connections to dry type transformers, to motors without flexible cords, and to other equipment with rotating or moving parts shall be liquidtight flexible metal conduit with watertight connectors installed without sharp bends and in the minimum lengths required for the application, but not longer than 6 feet unless otherwise acceptable to Engineer.
- e. Terminations and connections of rigid steel and intermediate metal conduit shall be taper threaded. Conduits shall be reamed free of burrs and shall be terminated with conduit bushings.
- f. Exposed conduit shall be installed either parallel or perpendicular to structural members and surfaces.
- g. Two or more conduits in the same general routing shall be parallel, with symmetrical bends.
- h. Conduits shall be at least 6 inches from high temperature piping, ducts, and flues.
- i. Conduit installed in corrosive chemical feed and storage areas as indicated by Area Type on the Drawings shall be rigid Schedule 40 PVC.
- j. Rigid Schedule 40 PVC conduit shall have supports and provisions for expansion as required by NEC Article 352.
- k. Metallic conduit connections to sheet metal enclosures shall be securely fastened by locknuts inside and outside.

- l. Rigid Schedule 40 PVC conduit shall be secured to sheet metal device boxes using a male terminal adapter with a locknut inside or by using a box adapter inserted through the knockout and cemented into a coupling.
- m. Conduits in walls or slabs, which have reinforcement in both faces, shall be installed between the reinforcing steel. In slabs with only a single layer of reinforcing steel, conduits shall be placed under the reinforcement. Conduits larger than 1/3 of the slab thickness shall be concrete encased under the slab.
- n. Conduits that cross structural joints where structural movement is allowed shall be fitted with concretetight and watertight expansion/deflection couplings, suitable for use with metallic conduits and rigid Schedule 40 PVC conduits. The couplings shall be Appleton Type DF, Crouse-Hinds Type XD, or O-Z Type DX.
- o. Conduit shall be clear of structural openings and indicated future openings including above each chemical tank within the chemical tank containment area.
- p. Conduits through roofs or metal walls shall be flashed and sealed watertight.
- q. Conduit installed through any openings cut into non-fire rated concrete or masonry structure elements shall be neatly grouted. Conduit penetrations of fire rated structure elements shall be sealed in a manner that maintains the fire rating as indicated on the architectural as-built drawings.
- r. Conduits shall be capped during construction to prevent entrance of dirt, trash, and water.
- s. Exposed conduit stubs for future use shall be terminated with galvanized pipe caps.
- t. Concealed conduit for future use shall be terminated in equipment or fitted with couplings plugged flush with structural surfaces.
- u. Where the Drawings indicate future duplication of equipment wired hereunder, concealed portions of conduits for future equipment shall be provided.
- v. Horizontal conduit shall be installed to allow at least 7 feet of headroom, except along structures, piping, and equipment or in other areas where headroom cannot be maintained.
- w. Conduit shall not be routed across the surface of a floor, roof, or walkway unless approved by Engineer.
- x. PVC-coated rigid steel conduit shall be threaded and installed as

recommended by the conduit manufacturer's installation procedure using appropriate tools.

- y. All conduits that enter enclosures shall be terminated with acceptable fittings that will not affect the NEMA rating of the enclosure.
- z. Nonmetallic conduit, which turns out of concrete slabs or walls, shall be connected to a 90 degree elbow of PVC-coated rigid steel conduit before it emerges. Conduits shall have PVC-coated rigid steel coupling embedded a minimum of 3 inches when emerging from slabs or walls and the coupling shall extend 2 inches from the wall.
- ab. Power conductors to and from adjustable frequency drives shall be installed in steel conduit.

3-7.02. Underground Conduit Installation. Not used.

3-7.03. Sealing of Conduits. After cable has been installed and connected, conduit ends shall be sealed by forcing nonhardening sealing compound into the conduits to a depth at least equal to the conduit diameter. This method shall be used for sealing all conduits at handholes and building entrance junction boxes, and for 1 inch and larger conduit connections to equipment.

Conduits entering chlorine feed and storage rooms shall be sealed in a junction box or conduit body adjacent to the point of entrance.

Conduits entering hazardous (classified) areas and submersible or explosion proof enclosures shall have Appleton "Type ESU" or Crouse-Hinds "EYS" sealing fittings with sealing compound.

3-7.04. Reuse of Existing Conduits. Existing conduits may be reused subject to the concurrence of Engineer and compliance with the following requirements:

- a. A wire brush shall be pulled through the conduit to remove any loose debris.
- b. A mandrel shall be pulled through the conduit to remove sharp edges and burrs.

3-8. WIRING DEVICES, BOXES, AND FITTINGS INSTALLATION. Metallic and nonmetallic conduit boxes and fittings shall be installed in the following locations:

3-8.01. Conduit Boxes and Fittings.

- a. Galvanized or cadmium plated, threaded, malleable iron boxes and fittings shall be installed in concrete walls, ceilings, and

floors; in the outdoor faces of masonry walls; and in all locations where weatherproof device covers are required. These boxes and fittings shall also be installed in exposed rigid steel and intermediate metal conduit systems.

- b. Galvanized or cadmium plated sheet steel boxes shall be installed in the indoor faces of masonry walls, in interior partition walls, and in joist supported ceilings.
- c. Rigid PVC device boxes shall be installed in exposed nonmetallic conduit systems.
- d. PVC coated boxes and fittings shall be installed in PVC coated conduit systems.
- e. Telephone conduit shall be provided with separate junction boxes and pull fittings.

3-8.02. Device Plates. Oversized plates shall be installed where standard-sized plates do not fully cover the wall opening.

3-8.03. Wall Switches.

- a. Wall switches shall be mounted 3'-6" above floor or grade. If within chemical basins, they shall also be a minimum of 12" above the maximum spill level.
- b. After circuits are energized, all wall switches shall be tested for proper operation.

3-8.04. Receptacles.

- a. Convenience outlets shall be 18 inches above the floor unless otherwise required. If within chemical basins, they shall also be a minimum of 12" above the maximum spill level.
- b. Convenience outlets outdoors and in garages; in basements, shops, storerooms, and rooms where equipment may be hosed down; shall be 4 feet above floor or grade. If within chemical basins, they shall also be a minimum of 12" above the maximum spill level.
- c. Welding receptacles shall be surface-mounted 4 feet above the floor. If within chemical basins, they shall also be a minimum of 12" above the maximum spill level.
- d. After circuits are energized, each receptacle shall be tested for correct polarity and each GFCI receptacle shall be tested for proper operation.

- e. Conduit and wire for convenience outlet installation is not shown on the Drawings and shall be sized, furnished, and installed by Contractor. Conductors shall be minimum 12 AWG and conduit shall be minimum 3/4 inch for convenience outlet installation.

3-8.05. Special Outlets.

- a. Wall thermostats shall be 4'-6" above the floor unless otherwise required. Thermostats on exterior walls shall be suitably insulated from wall temperature.
- b. Telephone outlets shall be 18 inches above the floor unless otherwise required. Telephone outlets outdoors and in garages; in basements, shops, storerooms, and rooms where equipment may be hosed down; shall be 4 feet above floor or grade.
- c. Clock outlets shall be located 7 feet above the floor.
- d. Horns and strobe lights for audio/visual alarms shall be mounted a minimum of 8 feet above finished floor and shall be positioned to provide maximum penetration of the surrounding area.

3-9. EQUIPMENT INSTALLATION. Except as otherwise specified or indicated on the Drawings, the following procedures shall be used in performing electrical work.

3-9.01. Setting of Equipment. All equipment, boxes, and gutters shall be installed level and plumb. Boxes, equipment enclosures, metal raceways, and similar items mounted on water- or earth-bearing walls shall be separated from the wall by at least 1/4 inch thick corrosion-resistant spacers. Where boxes, enclosures, and raceways are installed at locations where walls are not suitable or available for mounting, concrete equipment pads, framing material, and associated hardware shall be provided.

3-9.02. Sealing of Equipment. All outdoor substation, switchgear, motor control center, and similar equipment shall be permanently sealed at the base, and all openings into equipment shall be screened or sealed with concrete grout to keep out rodents and insects the size of wasps and mud daubers. Small cracks and openings shall be sealed from inside with silicone sealant, Dow-Corning "795" or General Electric "SCS1200".

3-10. GROUNDING.

3-10.01. General. The electrical system and equipment shall be grounded in compliance with the National Electrical Code and the following requirements:

- a. All ground conductors shall be at least 12 AWG soft drawn copper cable or bar, bare or green-insulated in accordance with the National Electrical Code.
- b. Ground cable splices and joints, ground rod connections, and equipment bonding connections shall meet the requirements of IEEE 837, and shall be exothermic weld connections or irreversible high-compression connections, Cadweld "Exothermic" or Burndy "Hyground". Mechanical connectors will not be acceptable. Cable connections to bus bars shall be made with high-compression two-hole lugs.
- c. Ground cable through exterior building walls shall enter within 3 feet below finished grade and shall be provided with a water stop. Unless otherwise indicated, installation of the water stop shall include filling the space between the strands with solder and soldering a 12 inch copper disc over the cable.
- d. Ground cable near the base of a structure shall be installed in earth and as far from the structure as the excavation permits, but not closer than 24 inches. The tops of ground rods and ground cable interconnecting ground rods shall be buried a minimum of 30 inches below grade, or below the frost line, whichever is deeper.
- e. All powered equipment, including lighting fixtures and receptacles, shall be grounded by a copper ground conductor in addition to the conduit connection.
- f. Ground connections to equipment and ground buses shall be made with copper or high conductivity copper alloy ground lugs or clamps. Connections to enclosures not provided with ground buses or ground terminals shall be made with irreversible high-compression type lugs inserted under permanent assembly bolts or under new bolts drilled and inserted through enclosures, other than explosion proof enclosures, or by grounding locknuts or bushings. Ground cable connections to anchor bolts; against gaskets, paint, or varnish; or on bolts holding removable access covers will not be acceptable.
- g. The grounding system shall be bonded to the station piping by connecting to the first flange inside the building, on either a suction or discharge pipe, with a copper bar or strap. The flange shall be drilled and tapped to provide a bolted connection.
- h. Ground conductors shall be routed as directly as possible, avoiding unnecessary bends. Ground conductor installations for equipment ground connections to the grounding system shall have turns with minimum bend radii of 12 inches.

- i. Ground rods not described elsewhere shall be a minimum of 3/4 inch in diameter by 10 feet long, with a copper jacket bonded to a steel core.
- j. Test wells and covers for non-traffic areas shall be molded high density polyethylene. Test wells for traffic areas shall be precast concrete construction rated for traffic duty with concrete or cast iron covers.

3-10.02. Grounding System Resistance. The ground system resistance shall comply with National Electrical Code.

3-10.03. Grounding System Testing. Not used.

3-11. LIGHTING FIXTURE INSTALLATION. The Drawings indicate the general locations and arrangements of the lighting fixtures. Fixtures in rows shall be aligned both vertically and horizontally unless otherwise specified. Fixtures shall be clear of pipes, mechanical equipment, structural openings, indicated future equipment and structural openings, and other obstructions.

Conduit and wire for lighting fixture installation is not shown on the Drawings and shall be sized, furnished and installed by Contractor. Circuits to emergency lighting units, exit signs, and fixtures indicated to be night lights shall not be switched. Circuits to fluorescent lighting fixtures indicated to have emergency battery packs shall include an additional un-switched hot conductor. Conductors shall be minimum 12 AWG and conduit shall be minimum 3/4 inch for lighting fixture installation.

3-12. POWER FACTOR CORRECTION CAPACITOR INSTALLATION. Not used.

3-13. MODIFICATIONS TO EXISTING EQUIPMENT. Modifications to existing equipment shall be completed as specified herein and indicated on the Drawings. All existing facilities shall be kept in service during construction. Temporary power or relocation of existing power and control wiring, equipment, and devices shall be provided as required during construction. Coordination and timing of outages shall be as specified in other sections of these Specifications. Electrical power interruptions will only be allowed where agreed upon in advance with Owner, and scheduling at times of low demand may be required.

3-13.01. Demolition. Unless otherwise specified or indicated on the Drawings, all cable and all exposed conduit for power and control signals of equipment indicated to be removed shall be demolished. Conduit supports and electrical equipment mounting hardware shall be removed, and holes or damage remaining shall be grouted or sealed flush. Conduit partially concealed shall be removed where exposed, and plugged with expanding grout flush with the floor

or wall. Repairs shall be refinished to match the existing surrounding surfaces. Demolished equipment shall be discarded or salvaged as indicated on the Drawings and as specified in other sections of these Specifications.

3-13.02. Area 60 Tank Farm Chemical Containment Area Modifications. The scope of the modifications includes the rerouting of all existing conduit within the Area 60 Tank Farm Chemical Containment Area that is below the Chemical Tank Containment Area Max Spill Level as noted on the drawings. During chemical spills these conduits can become filled with chemicals that eventually leak out in the electrical room. The scope includes demolition of the existing conduit systems and wiring that are routed below the spill level and/or through the bottom of the spill area floors. Each containment area's max spill height is relative to the respective tank and is identified in the table on drawing 60-E-431. The circuit schedules in the drawings list the equipment associated with the Chemical Containment Area. Equipment listed will have their associated existing conduit and wiring demolished and new cable and conduit provided in the quantity and from the location shown on the schedule. The plan drawings show the locations of both the equipment in the containment area and the source location of the conduit. The contractor shall be responsible for determining the exact routing path of the conduit in accordance with the drawings and this specification.

The contractor shall reroute new conduit for each piece of affected equipment in accordance with the circuit schedule and the conduit routing parameters. At no time shall the new conduit system be routed below the max spill level. If an existing piece of equipment is located below the spill level then the conduit shall be permitted to be routed to the equipment and it must come from above as to not let any possible chemical flow be trapped in the conduit system. Conduit shall be routed along new and existing catwalks, walls, ceilings, containment walls (above max spill level), non-removable handrails, and other structural elements. Conduit routing shall not interfere with walkways and egress paths. Contractor shall construct unistrut support structures where required to go over walkways in accordance with the electrical detail drawings.

Some groups of existing conduits that go to the area termination cabinets, as shown on Detail 2 of drawing 60-E-431, shall be concrete encased to above the max spill level in order to reuse the existing conduits back to the electrical and chemical pump rooms.

Contractor shall coordinate all outages and construction sequencing with the City for approval to reduce chemical down times and to maintain minimal chemical functionality at all times. New conduit and wire shall be installed to the extent possible prior to demolition to reduce down times during switch over.

End of Section

NOVEMBER 2014
WBS NO. B10178
MBC CHEMICAL SYSTEMS IMPROVEMENTS – PHASE II

ELECTRICAL
16050 - 22

STANDARD SPECIFICATIONS

REFERENCE: UL 83, ICEA S-95-658 (NEMA WC70).

CONDUCTOR: Solid, uncoated copper. Maximum operating temperature 90°C dry, 75°C wet.

INSULATION: Polyvinyl chloride, UL 83, Type THHN and THWN, ICEA S-95-658.

SHIELD: None.

JACKET: Conductor: Nylon, 4 mils (100 µm) minimum thickness, UL 83.

FACTORY TESTS: Cable shall meet the requirements of UL 83 for Type THHN and THWN.

Cable Details

Size		Number of Strands	Conductor Insulation Thickness*		Maximum Outside Diameter	
AWG or kcmil	mm ²		in.	µm	in.	mm
12	4.0	1	0.015	380	0.17	4.32
10	6.0	1	0.020	510	0.20	5.08

*The average thickness shall be not less than that indicated above. The minimum thickness shall not be less than 90 percent of the values indicated above.

A durable marking shall be provided on the surface of the cable at intervals not exceeding 24 inches (600 mm). Marking shall include manufacturer's name, THWN or THHN, conductor size, and 600 volt.

600 Volt, Single Conductor Lighting Cable (600-1-PVC-THHN-THWN)

BLACK & VEATCH

Cable Data

Figure 1-1605026 05 11

STANDARD SPECIFICATIONS

REFERENCE: ICEA S-95-658 (NEMA WC 70).

CONDUCTOR: Concentric-lay, uncoated copper; strand Class B. Wet/dry maximum operating temperature 90°C.

INSULATION: Cross-linked thermosetting polyethylene, ICEA S-95-658, Paragraph 3.6.

SHIELD: None.

JACKET: None.

FACTORY TESTS: Cable shall meet the requirements of ICEA S-95-658.

Cable Details

Size		Number of Strands	Conductor Insulation Thickness*		Maximum Outside Diameter	
AWG or kcmil	mm ²		in.	µm	in.	mm
14	2.5	7	0.030	760	0.17	4.32
12	4.0	7	0.030	760	0.19	4.83
10	6.0	7	0.030	760	0.21	5.33
8	10.0	7	0.045	1140	0.27	6.86
6	16.0	7	0.045	1140	0.31	7.87
4	25.0	7	0.045	1140	0.36	9.14
2	35.0	7	0.045	1140	0.42	10.67
1	40.0	19	0.055	1400	0.48	12.19
1/0	50.0	19	0.055	1400	0.52	13.21
2/0	70.0	19	0.055	1400	0.57	14.48
4/0	95.0	19	0.055	1400	0.68	17.27
250	120.0	37	0.065	1650	0.75	19.05
350	185.0	37	0.065	1650	0.85	21.59
500	300.0	37	0.065	1650	0.98	24.89
750	400.0	61	0.080	2030	1.22	31.00
1,000	500.0	61	0.080	2030	1.37	34.80

*The average thickness shall be not less than that indicated above. The minimum thickness shall be not less than 90 percent of the values indicated above.

A durable marking shall be provided on the surface of the cable at intervals not exceeding 24 inches (600 mm). Marking shall include manufacturer's name, XLP, XHHW-2, conductor size, and voltage class.

600 Volt, Single Conductor Lighting/Power Cable (600-1-XLP-NONE-XHHW-2)

BLACK & VEATCH

Cable Data

Figure 2-1605026 05 11

STANDARD SPECIFICATIONS

REFERENCE: UL 83, ICEA S-95-658 (NEMA WC 70).

CONDUCTOR: Stranded, uncoated copper. Maximum operating temperature 90°C dry, 75°C wet.

INSULATION: Polyvinyl chloride, UL 83, Type THHN and THWN, ICEA S-95-658.

SHIELD: None.

JACKET: Conductor: Nylon, 4 mils (100 µm) minimum thickness, UL 83.

FACTORY TESTS: Cable shall meet the requirements of UL 83 for Type THHN and THWN.

Cable Details

Size		Number of Strands	Conductor Insulation Thickness*		Maximum Outside Diameter	
AWG or kcmil	mm ²		in.	µm	in.	mm
14	2.5	19	0.015	381	0.12	3.05
12	4.0	19	0.015	381	0.14	3.56
10	6.0	19	0.020	508	0.17	4.32
8	10.0	19	0.030	762	0.23	5.84
6	16.0	19	0.030	762	0.26	6.60
4	25.0	19	0.040	1016	0.33	8.38
2	35.0	19	0.040	1016	0.39	9.91
1	40.0	19	0.050	1270	0.44	11.18
1/0	50.0	19	0.050	1270	0.50	12.70
2/0	70.0	19	0.050	1270	0.54	13.72
4/0	95.0	19	0.050	1270	0.66	16.76
250	120.0	37	0.060	1520	0.72	18.29
350	185.0	37	0.060	1520	0.83	21.08
500	300.0	37	0.060	1520	0.96	24.38
750	400.0	61	0.070	1780	1.17	29.72
1,000	500.0	61	0.070	1780	1.32	33.53

*The average thickness shall be not less than that indicated above. The minimum thickness shall be not less than 90 percent of the values indicated above.

A durable marking shall be provided on the surface of the cable at intervals not exceeding 24 inches (600 mm). Marking shall include manufacturer's name, THWN or THHN, conductor size, and 600 volt.

600 Volt, Single Conductor Power Cable (600-1-PVC-THHN-THWN)

BLACK & VEATCH

Cable Data

Figure 3-1605026 05 11

STANDARD SPECIFICATIONS

REFERENCE: UL 62, UL 1277.

CONDUCTOR: 16 AWG (1.5 mm²), 7-strand, concentric-lay, uncoated copper. Maximum operating temperature 90°C dry, 75°C wet.

INSULATION: Polyvinyl chloride, not less than 15 mils (380 μm) average thickness; 13 mils (330 μm) minimum thickness, UL 62, Type TFN.

LAY: Twisted pair with 1-1/2 inch to 2-1/2 inch (38.10 mm - 63.5 mm) lay.

SHIELD: Cable assembly, combination aluminum-polyester tape and 7-strand, 20 AWG (0.5 mm²) minimum size, tinned copper drain wire, shield applied to achieve 100 percent cover over insulated conductors.

JACKET: Conductor: Nylon, 4 mils (100 μm) minimum thickness, UL 62.
Cable assembly: Black, flame-retardant polyvinyl chloride, UL 1277, applied over tape-wrapped cable core.

CONDUCTOR IDENTIFICATION: One conductor black, one conductor white.

FACTORY TESTS: Insulated conductors shall meet the requirements of UL 62 for Type TFN. Assembly jacket shall meet the requirements of UL 1277. Cable shall meet the vertical-tray flame test requirements of UL 1277.

Cable Details

	Assembly Jacket Thickness*		Maximum Outside Diameter	
	in.	μm	in.	mm
Single Pair	0.045	1140	0.34	8.64

*The average thickness shall be not less than that indicated above. The minimum thickness shall be not less than 80 percent of the value indicated above.

A durable marking shall be provided on the surface of the cable at intervals not exceeding 24 inches (600 mm). Marking shall include manufacturer's name, Type TC, Type TFN, conductor size, single pair, and voltage class.

600 Volt, Single Pair, Shielded Instrument Cable (600-SINGLE-PAIR-SH-INSTR)

BLACK & VEATCH

Cable Data

Figure 4-1605026 05 11

STANDARD SPECIFICATIONS

REFERENCE: UL 62, UL 1277.
 CONDUCTOR: 16 AWG (1.5 mm²), 7-strand, concentric-lay, uncoated copper. Maximum operating temperature 90°C dry, 75°C wet.
 INSULATION: Polyvinyl chloride, not less than 15 mils (380 μm) average thickness; 13 mils (330 μm) minimum thickness, UL 62, Type TFN.
 LAY: Twisted triad with 1-1/2 inch to 2-1/2 inch (38.10 mm - 63.5 mm) lay.
 SHIELD: Cable assembly, combination aluminum-polyester tape and 7-strand, 20 AWG (0.5 mm²) minimum size, tinned copper drain wire, shield applied to achieve 100 percent cover over insulated conductors.
 JACKET: Conductor: Nylon, 4 mils (100 μm) minimum thickness, UL 62.
 Cable assembly: Black, flame-retardant polyvinyl chloride, UL 1277, applied over tape-wrapped cable core.
 CONDUCTOR IDENTIFICATION: One conductor black, one conductor white, one conductor red.
 FACTORY TESTS: Insulated conductors shall meet the requirements of UL 62 for Type TFN. Assembly jacket shall meet the requirements of UL 1277. Cable shall meet the vertical-tray flame test requirements of UL 1277.

Cable Details

	Assembly Jacket Thickness*		Maximum Outside Diameter	
	in.	μm	in.	mm
Single Triad	0.045	1140	0.35	8.87

*The average thickness shall be not less than that indicated above. The minimum thickness shall be not less than 80 percent of the value indicated above.

A durable marking shall be provided on the surface of the cable at intervals not exceeding 24 inches (600 mm). Marking shall include manufacturer's name, Type TC, Type TFN, conductor size, single triad, and voltage class.

600 Volt, Single Triad, Shielded Instrument Cable (600-SINGLE-TRIAD-SH-INSTR)

BLACK & VEATCH

Cable Data

Figure 5-1605026 05 11

STANDARD SPECIFICATIONS

REFERENCE: UL 62, UL 1277.

CONDUCTOR: 18 AWG (0.75 mm²), 7-strand, concentric-lay, uncoated copper. Maximum operating temperature 90°C dry, 75°C wet.

INSULATION: Polyvinyl chloride, not less than 15 mils (380 μm) average thickness; 13 mils (330 μm) minimum thickness, UL 62, Type TFN.

LAY: Twisted pairs or triads with 1-1/2 inch to 2-1/2 inch (38.10 - 63.5 mm) lay.

SHIELD: Each pair or triad and cable assembly: Combination aluminum-polyester tape and 7-strand, 20 AWG (0.5 mm²) minimum size, tinned copper drain wire, shield applied to achieve 100 percent cover over insulated conductors. Shield tape on pair and/or triad assemblies shall be applied in such a way as to give total shield isolation from all other pairs' or triads' shields.

JACKET: Conductor: Nylon, 4 mils (100 μm) minimum thickness, UL 62.

Cable Assembly: Black, 90°C, flame-retardant polyvinyl chloride, UL 1277, Table 10.17, applied over tape-wrapped cable core.

CONDUCTOR IDENTIFICATION:

Pair: One conductor black, one conductor white.

Triad: One conductor black, one conductor white, one conductor red.

PAIR Identification: Each pair and/or triad numbered.

FACTORY TESTS: Insulated conductors shall meet the requirements of UL 62 for Type TFN. Assembly jacket shall meet the requirements of UL 1277. Cable shall meet the vertical-tray flame test requirements of UL 1277.

Cable Details

	Assembly Jacket Thickness*		Maximum Outside Diameter	
	in.	μm	in.	mm
Number of Pairs				
4	0.045	1140	0.554	14.07
8	0.060	1520	0.749	19.02
12	0.060	1520	0.896	22.76
24	0.060	1520	1.256	31.90
Number of Triads				
4	0.060	1520	0.648	16.46
8	0.060	1520	0.823	20.99
12	0.080	2030	1.030	26.16
24	0.080	2030	1.393	35.38

*The average thickness shall be not less than that indicated above. The minimum thickness shall be not less than 80 percent of the values indicated above.

A durable marking shall be provided on the surface of the cable at intervals not exceeding 24 inches (600 mm). Marking shall include manufacturer's name, Type TC, Type TFN, conductor size, number of pairs or triads, and voltage class.

**600 Volt, Multiple Pair and/or Triad, Shielded Instrument Cable
(600-MULTI-PAIRS-TRIADS-SH-INSTR)**

BLACK & VEATCH	Cable Data	Figure 6-1605026 05 11
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STANDARD SPECIFICATIONS

REFERENCE: UL 83, UL 1277, ICEA S-73-532, ICEA S-58-679.

CONDUCTOR: 14 AWG (2.5 mm²), 7 or 19 strands, concentric-lay, uncoated copper. Maximum operating temperature 90°C dry, 75°C wet.

INSULATION: Polyvinyl chloride, not less than 15 mils (380 μm) average thickness; 13 mils (330 μm) minimum thickness, UL 83, Type THHN and THWN.

SHIELD: None.

JACKET: Conductor: Nylon, 4 mils (100 μm) minimum thickness, UL 83.
Cable assembly: Black, flame-retardant polyvinyl chloride, UL 1277, applied over tape-wrapped cable core.

CONDUCTOR IDENTIFICATION: ICEA S-58-679, Method 1, Table 2 or ICEA S-58-679, Method 3, Table 2. White or green conductors shall not be provided.

FACTORY TESTS: Insulated conductors shall meet the requirements of UL 83 for Type THHN-THWN. Assembly jacket shall meet the requirements of UL 1277. Cable shall meet the flame test requirements of UL 1277 for Type TC power and control tray cable.

Cable Details

Number of Conductors	Assembly Jacket Thickness*		Maximum Outside Diameter	
	in.	μm	in.	mm
2	0.045	1140	0.38	9.65
3	0.045	1140	0.39	9.91
4	0.045	1140	0.44	11.18
5	0.045	1140	0.46	11.68
7	0.045	1140	0.49	12.45
9	0.045	1140	0.61	15.49
12	0.060	1520	0.66	16.76
19	0.060	1520	0.77	19.56
24	0.060	1520	0.93	23.62
30	0.080	2030	0.98	24.89
37	0.080	2030	1.05	26.67

*The average thickness shall be not less than that indicated above. The minimum thickness shall be not less than 80 percent of the values indicated above.

A durable marking shall be provided on the surface of the cable at intervals not exceeding 24 inches (600 mm). Marking shall include manufacturer's name, Type TC, Type THWN or THHN, conductor size, number of conductors, and voltage class.

600 Volt, Multiconductor 14 AWG (2.5 mm²) Control Cable (600-MULTI-THHN-THWN)

BLACK & VEATCH

Cable Data

Figure 7-1605026 05 11

STANDARD SPECIFICATIONS

REFERENCE: UL 83, UL 1277, ICEA S-73-532, ICEA S-58-679.

CONDUCTOR: 12 AWG (4 mm²), 7 or 19 strands, concentric-lay, uncoated copper. Maximum operating temperature 90°C dry, 75°C wet.

INSULATION: Polyvinyl chloride, not less than 15 mils (380 μm) average thickness; 13 mils (330 μm) minimum thickness, UL 83, Type THHN and THWN.

SHIELD: None.

JACKET: Conductor: Nylon, 4 mils (100 μm) minimum thickness, UL 83.
Cable assembly: Black, flame-retardant polyvinyl chloride, UL 1277, applied over tape-wrapped cable core.

CONDUCTOR IDENTIFICATION: ICEA S-58-679, Method 1, Table 2 or ICEA S-58-679, Method 3, Table 2. White or green conductors shall not be provided.

FACTORY TESTS: Insulated conductors shall meet the requirements of UL 83 for Type THHN-THWN. Assembly jacket shall meet the requirements of UL 1277. Cable shall meet the flame test requirements of UL 1277 for Type TC power and control tray cable.

Cable Details

Number of Conductors	Assembly Jacket Thickness*		Maximum Outside Diameter	
	in.	μm	in.	mm
2	0.045	1140	0.46	11.68
3	0.045	1140	0.49	12.45
4	0.045	1140	0.56	14.22
5	0.045	1140	0.60	15.24
7	0.045	1140	0.66	16.76
9	0.060	1520	0.77	19.56
12	0.060	1520	0.91	23.11
19	0.060	1520	1.05	26.67
24	0.060	1520	1.22	30.99
30	0.080	2030	1.29	32.77
37	0.080	2030	1.40	35.56

*The average thickness shall be not less than that indicated above. The minimum thickness shall be not less than 80 percent of the values indicated above.

A durable marking shall be provided on the surface of the cable at intervals not exceeding 24 inches (600 mm). Marking shall include manufacturer's name, Type TC, Type THWN or THHN, conductor size, number of conductors, and voltage class.

600 Volt, Multiconductor 12 AWG (4 mm²) Control Cable (600-MULTI-THHN-THWN)

BLACK & VEATCH

Cable Data

Figure 8-1605026 05 11

STANDARD SPECIFICATIONS

REFERENCE: ICEA S-93-639 (NEMA WC 74), AEIC CS-8, ICEA P-45-482.

CONDUCTOR: Concentric-lay, uncoated or coated copper, strand Class B. Normal maximum operating temperature 90°C.

CONDUCTOR SHIELD: Extruded semiconducting thermosetting material, ICEA S-93-639, Section 3.

INSULATION: Ethylene-propylene rubber, ICEA S-93-639, Section 4, not less than 115 mils (2920 μm) average thickness; 103.5 mils (2630 μm) minimum thickness.

INSULATION SHIELD: Extruded semiconducting thermosetting material, and nonembedded coated copper tape or coated copper wires, ICEA S-93-639, Section 5. Extruded material shall be tested in accordance with ICEA S-93-639 and AEIC CS-8. Shield area shall be not less than that of one helically applied 5 mil (130 μm) copper tape with a 10 percent overlap when calculated according to Formula 3 in ICEA P-45-482.

JACKET: Black polyvinyl chloride, ICEA S-93-639, Paragraph 7.1.9.

FACTORY TEST: Cable shall meet the requirements of ICEA S-93-639 and AEIC No. CS-8.

Cable Details

Size		Number of Strands	*Jacket Thickness		Maximum Outside Diameter	
AWG or kcmil	mm ²		in.	μm	in.	mm
6	16	7	0.060	1520	0.74	18.8
4	25	7	0.060	1520	0.78	19.81
2	35	7	0.060	1520	0.84	21.34
1	40	19	0.060	1520	0.88	22.35
1/0	50	19	0.060	1520	0.92	23.37
2/0	70	19	0.080	2030	1.01	25.65
4/0	95	19	0.080	2030	1.12	28.45
250	120	37	0.080	2030	1.18	29.97
350	185	37	0.080	2030	1.29	32.77
500	300	37	0.080	2030	1.45	36.88
750	400	61	0.080	2030	1.65	41.91
1000	500	61	0.080	2030	1.81	45.97

*The average thickness shall be not less than that indicated above. The minimum thickness shall be not less than 80 percent of the values indicated above.

The conductor shield, insulation, and insulation shield shall be applied in a triple extrusion process with all three components being cured at the same time.

The color of the insulation shall be in contrast to the color of the semiconducting paint. The semiconducting paint shall be readily removable for terminating.

A durable marking shall be provided on the surface of the cable at intervals not exceeding 24 inches (600 mm). Marking shall include manufacturer's name, insulating material, conductor size, and voltage class.

**Voltage Test After Installation: DC Test Voltage - 36 kV
Duration of Test - 15 Minutes**

**8000 Volt, Single Conductor Power Cable
100 Percent Insulation Level (8000-1-EPR-PVC-SH)**

BLACK & VEATCH

Cable Data

Figure 9-1605026 05 11

STANDARD SPECIFICATIONS

REFERENCE: ICEA S-93-639 (NEMA WC 74), AEIC CS-8, ICEA P-45-482.

CONDUCTOR: Concentric-lay, uncoated or coated copper, strand Class B. Normal maximum operating temperature 90°C.

CONDUCTOR SHIELD: Extruded semiconducting thermosetting material, ICEA S-93-639, Section 3.

INSULATION: Ethylene-propylene rubber, ICEA S-93-639, Section 4, not less than 220 mils (5590 μm) average thickness; 198 mils (5030 μm) minimum thickness.

SHIELD: Extruded semiconducting thermosetting material, and nonembedded coated copper tape or coated copper wires, ICEA S-93-639, Section 5. Extruded material shall be tested in accordance with ICEA S-93-639 and AEIC CS-8. Shield area shall be not less than that of one helically applied 5 mil (130 μm) copper tape with a 10 percent overlap when calculated according to Formula 3 in ICEA P-45-482.

JACKET: Black polyvinyl chloride, ICEA S-93-639, Paragraph 7.1.9.

FACTORY TEST: Cable shall meet the requirements of ICEA S-93-639 and AEIC CS-8.

Cable Details

Size		Number of Strands	*Jacket Thickness		Maximum Outside Diameter	
AWG or kcmil	mm ²		in.	μm	in.	mm
2	35	19	0.080	2030	1.14	28.96
1	40	19	0.080	2030	1.17	29.72
1/0	50	19	0.080	2030	1.21	30.73
2/0	70	19	0.080	2030	1.25	31.75
4/0	95	19	0.080	2030	1.30	33.02
250	120	37	0.080	2030	1.43	36.32
350	185	37	0.080	2030	1.53	38.86
500	300	37	0.080	2030	1.66	42.16
750	400	61	0.110	2790	1.95	49.53
1000	500	61	0.110	2790	2.19	55.63

*The average thickness shall be not less than that indicated above. The minimum thickness shall be not less than 80 percent of the values indicated above.

The conductor shield, insulation, and insulation shield shall be applied in a triple extrusion process with all three components being cured at the same time.

The color of the insulation shall be in contrast to the color of the semiconducting paint. The semiconducting paint shall be readily removable for terminating.

A durable marking shall be provided on the surface of the cable at intervals not exceeding 24 inches (600 mm). Marking shall include manufacturer's name, insulating material, conductor size, and voltage class.

**Voltage Test After Installation: DC Test Voltage - 53 kV
Duration of Test - 15 Minutes**

**15,000 Volt, Single Conductor Power Cable
133 Percent Insulation Level (15-1-EPR-PVC-SH)**

BLACK & VEATCH

Cable Data

Figure 10-1605026 05 11

STANDARD SPECIFICATIONS

REFERENCE: ICEA S-95-658 (NEMA WC 70).

CONDUCTOR: Concentric lay, uncoated copper; strand Class B. Normal maximum operating temperature 90°C.

INSULATION: Cross-linked thermosetting polyethylene, ICEA S-95-658, Paragraph 3.6.

SHIELD: None.

JACKET: Cable assembly; black, flame-retardant polyvinyl chloride, UL1277, applied over tape-wrapped cable core.

FACTORY TEST: Cable shall meet the requirements of ICEA S-95-658, UL1277 and IEEE Standard 1202 ribbon burner flame test.

Cable Details

Size		Number of Strands	*Conductor Insulation Thickness		**Assembly Jacket Thickness		Maximum Outside Diameter	
AWG or kcmil	mm ²		in.	mm	in.	µm	in.	mm
12	4	7	0.030	0.76	0.045	1140	0.46	11.68
10	6	7	0.030	0.76	0.045	1140	0.51	12.95
8	10	7	0.045	1.14	0.060	1520	0.68	17.27
6	16	7	0.045	1.14	0.060	1520	0.76	19.30
4	25	7	0.045	1.14	0.060	1520	0.91	23.11
2	35	7	0.045	1.14	0.060	1520	1.03	26.16
1	40	19	0.055	1.40	0.080	2030	1.16	29.46
1/0	50	19	0.055	1.40	0.080	2030	1.26	32.00
2/0	70	19	0.055	1.40	0.080	2030	1.36	34.54
4/0	95	19	0.055	1.40	0.080	2030	1.60	40.64

*The average thickness shall be not less than indicated above. The minimum thickness shall be not less than 90 percent of the values indicated above.

**The average thickness shall be not less than indicated above. The minimum thickness shall be not less than 80 percent of the values indicated above.

A durable marking shall be provided on the surface of the cable at intervals not exceeding 24 inches (600 mm). Marking shall include manufacturer's name, XLP, XHHW, Type TC, conductor size, and voltage class.

600 Volt, 3 Conductor With Ground Power Tray Cable (600-3-XLP-PVC-TC)

BLACK & VEATCH

Cable Data

Figure 11-1605026 05 11

STANDARD SPECIFICATIONS

REFERENCE: ICEA S-95-658 (NEMA WC 70).

CONDUCTOR: Concentric-lay, uncoated copper; strand Class B. Wet/dry maximum operating temperature 90°C.

INSULATION: Cross-linked thermosetting polyethylene, ICEA S-95-658, Paragraph 3.6.

SHIELD: None.

JACKET: None.

FACTORY TESTS: Cable shall meet the requirements of ICEA S-95-658, UL and IEEE Standard 1202 ribbon burner flame tests.

Cable Details

Size		Number of Strands	Conductor Insulation Thickness*		Maximum Outside Diameter	
AWG or kcmil	mm ²		in.	μm	in.	mm
250	120	37	0.065	1650	0.72	18.29
350	185	37	0.065	1650	0.83	21.08
500	240	37	0.065	1650	0.95	24.13
750	400	61	0.080	2030	1.17	29.72
1000	500	61	0.080	2030	1.35	34.29

*The average thickness shall be not less than indicated above. The minimum thickness shall be not less than 90 percent of the values indicated above.

A durable marking shall be provided on the surface of the cable at intervals not exceeding 24 inches (600 mm). Marking shall include manufacturer's name, VW-1, XHHW-2, Type TC, conductor size, and voltage class.

**600 Volt, Single Conductor Power Tray Cable
(600-1-VW-1-NONE-XHHW-2-TC)**

BLACK & VEATCH

Cable Data

Figure 12-1605026 05 11

STANDARD SPECIFICATIONS

REFERENCE: ICEA S-95-658 (NEMA WC 70).

CONDUCTOR: Concentric-lay, uncoated copper; strand Class B. Normal maximum operating temperature 90°C.

INSULATION: Cross-linked thermosetting polyethylene, ICEA S-95-658, Paragraph 3.6.

SHIELD: None.

JACKET: None.

FACTORY TESTS: Cable shall meet the requirements of ICEA S-95-658.

Cable Details

Size		Number of Strands	Conductor Insulation Thickness*		Maximum Outside Diameter	
AWG or kcmil	mm ²		in.	µm	in.	mm
14	2.5	7	0.045	1140	0.19	4.83
12	4.0	7	0.045	1140	0.22	5.59
10	6.0	7	0.045	1140	0.24	6.10
8	10.0	7	0.060	1520	0.31	7.87
6	16.0	7	0.060	1520	0.35	8.89
4	25.0	7	0.060	1520	0.39	9.91
2	35.0	7	0.060	1520	0.46	11.68
1	40.0	19	0.080	2030	0.54	13.72
1/0	50.0	19	0.080	2030	0.59	14.99
2/0	70.0	19	0.080	2030	0.63	16.00
4/0	95.0	19	0.080	2030	0.74	18.80
250	120.0	37	0.095	2410	0.82	20.83
350	185.0	37	0.095	2410	0.91	23.11
500	300.0	37	0.095	2410	1.04	26.42
750	400.0	61	0.110	2790	1.28	32.51
1,000	500.0	61	0.110	2790	1.44	36.58

*The average thickness shall be not less than that indicated above. The minimum thickness shall be not less than 80 percent of the values indicated above.

A durable marking shall be provided on the surface of the cable at intervals not exceeding 24 inches (600 mm). Marking shall include manufacturer's name, XLP, RHH or RHW or USE, conductor size, and voltage class.

600 Volt, Single Conductor Power Cable (600-1-XLP-NONE-RHH-RHW-USE)

BLACK & VEATCH

Cable Data

Figure 13-1605026 05 11

STANDARD SPECIFICATIONS

REFERENCE: Type MC, UL 83 and 1569.

CONDUCTOR: Solid, uncoated copper. Maximum operating temperature 90°C dry.

INSULATION: Polyvinyl chloride, UL 83, Type THHN.

GROUND: Copper conductor sized per NEC with green THHN insulation.

JACKET: Conductor: Nylon.

ARMOR: Galvanized interlocked steel.

FACTORY TESTS: Conductors shall meet the requirements of UL 83 for Type THHN. Assembly shall meet the requirements of UL 1569 for Type MC.

Cable Details

Size		Number of Conductors	Ground Size (AWG)	Number of strands per conductor	Nominal Outside Diameter	
AWG or kcmil	mm ²				in.	mm
12	4.0	2	12	1	0.492	12.50
12	4.0	3	12	1	0.531	13.49
12	4.0	4	12	1	0.579	14.71
10	6.0	2	10	1	0.562	14.27
10	6.0	3	10	1	0.610	15.49
10	6.0	4	10	1	0.641	16.28

600 Volt, Type MC Metal Clad Lighting Cable (Metal Clad THHN)

BLACK & VEATCH

Cable Data

Figure 14-1605026 05 11

STANDARD SPECIFICATIONS

REFERENCE: ICEA S-66-524 (NEMA WC 7).

CONDUCTOR: Stranded, uncoated copper. Maximum operating temperature 90°C.

INSULATION: Cross-linked polyethylene, ICEA S-66-524.

GROUND: Copper conductor sized per NEC with green insulation.

SHIELD: Cable assembly: Copper tape or aluminum foil-polyester tape, shield applied to achieve 100 percent cover over insulated conductors.

JACKET: Cable assembly: Black, flame-retardant polyvinyl chloride, UL 1277, applied over tape-wrapped cable core.

FACTORY TEST: Cable shall meet the requirements of ICEA S-66-524, UL1277 and IEEE Standard 1202 ribbon burner flame test.

Cable Details

Size		Number of Strands	*Conductor Insulation Thickness		**Assembly Jacket Thickness		Maximum Outside Diameter	
AWG or kcmil	mm ²		in.	mm	in.	µm	in.	mm
12	4	7	0.060	1.52	0.060	1520	0.66	16.80
10	6	7	0.060	1.52	0.060	1520	0.71	18.14
8	10	7	0.070	1.78	0.060	1520	0.93	23.74
6	16	7	0.070	1.78	0.080	2030	1.04	26.40
4	25	7	0.070	1.78	0.080	2030	1.21	30.67
2	35	7	0.070	1.78	0.080	2030	1.35	34.40
1	40	7	0.070	1.78	0.080	2030	1.35	34.40
1/0	50	19	0.090	2.29	0.080	2030	1.70	43.07
2/0	70	19	0.090	2.29	0.080	2030	1.77	44.94
4/0	95	19	0.090	2.29	0.110	2800	2.02	51.34
250	120	37	0.105	2.67	0.110	2800	2.30	58.49
350	185	37	0.105	2.67	0.110	2800	2.63	66.70
500	300	37	0.105	2.67	0.110	2800	3.12	79.26

*The average thickness shall be not less than indicated above. The minimum thickness shall be not less than 90 percent of the values indicated above.

**The average thickness shall be not less than indicated above. The minimum thickness shall be not less than 80 percent of the values indicated above.

A durable marking shall be provided on the surface of the cable at intervals not exceeding 24 inches (600 mm). Marking shall include manufacturer's name, XLP, RHW, Type TC, conductor size, and voltage class.

2000 Volt, 3 Conductor Adjustable Frequency Drive Cable (2000-3-AFD-XLP-PVC-SH-TC)

BLACK & VEATCH

Cable Data

Figure 15-1605026 05 11

Project and Location _____
 Circuit Designation _____

Project No. _____
 Date _____

DC TEST DATA			
Time in Minutes After 100% Test Voltage Is Applied	Current, μ A		
	Phase A	Phase B	Phase C
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
kV dc after 1 min Decay			

DC Test Voltage _____

Cable Installation: New ____ Used ____ Years ____

Cable: Size _____ Length: _____

Oper. kV _____ Grounded _____ Ungrounded _____

Rated Cable Voltage _____

Insulation Wall _____
 (Type & Thickness)

Conductor Jacket Wall _____
 Type & Thickness)

Shield _____
 (Type)

Cable Manufacturer _____

Temperature _____ Humidity _____

Type of Termination _____

Type of Splice & Location _____

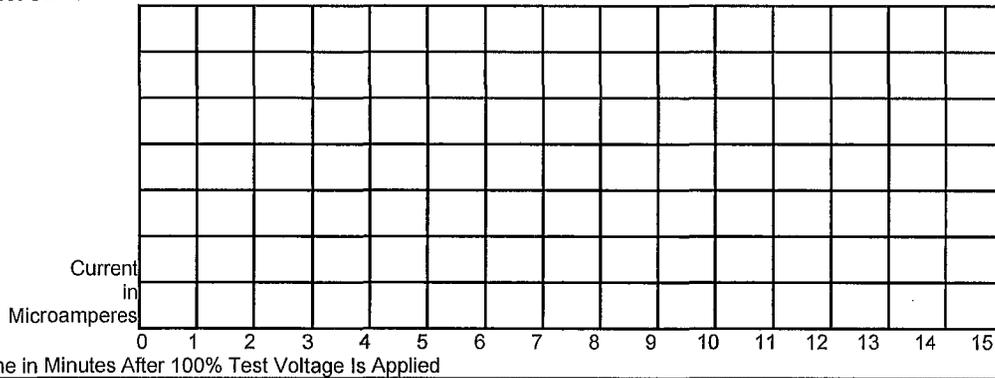
Remarks _____

100 Microamperes (μ A) = 0.1 Milliampere

APPLICATION OF TEST VOLTAGE

The initially applied direct-current voltage shall be not greater than 3.0 times the rated alternating-current voltage. The rate of increase from the initially applied voltage to the specified test voltage shall be not over 100 percent in 10 seconds nor less than 100 percent in 60 seconds. The duration of the direct-current voltage test shall be 15 minutes for shielded cables and 5 minutes for nonshielded cables.

Test Curve



NOTES:

1. Plot results of tests on all three phases on this graph.
2. Assign and indicate values for each division on the microamperes scale as required for the circuit being tested.

Cable Test Data Form

BLACK & VEATCH

Cable Data

Figure 16-1605026 05 11

Section 16220

COMMON MOTOR REQUIREMENTS FOR PROCESS EQUIPMENT

PART 1 – GENERAL

1-1. SCOPE. This section covers single and three-phase, small (fractional) and medium (integral) horsepower, alternating current motors rated 500 horsepower and less (NEMA MG1).

Motors shall be designated and coordinated with the driven equipment and shall be located as indicated on the Drawings.

1-2. GENERAL. Motors furnished under driven equipment Specification sections shall be fabricated and assembled in full conformity with Drawings, Specifications, engineering data, instructions, and recommendations of the equipment manufacturer unless exceptions are noted by the Engineer.

Where applicable, individual motor data sheets have been developed which specify additional requirements for specific motors.

1-2.01. General Equipment Stipulations. The General Equipment Stipulations section shall apply to all motors, unless otherwise specified. If requirements in this section differ from those in the General Equipment Stipulations section, the requirements specified herein shall take precedence.

1-2.02. Seismic Design Requirements. Seismic design requirements for products specified herein shall be as indicated in the Meteorological and Seismic Design Criteria section.

1-2.03. Governing Standards. Motors furnished under this section shall be designed, constructed, and tested in accordance with the latest version of NEMA MG 1, NEMA MG 10, and IEEE 112, Test Method B.

1-2.04. Nameplates. All motor nameplate data shall conform to NEMA MG 1 requirements.

1-3. SUBMITTALS. Complete assembly, foundation, and installation drawings, together with complete engineering data covering the materials used, parts, devices, and accessories forming a part of the motor shall be submitted in accordance with the Greenbook and Whitebook Submittals section. The drawings and data shall include, but shall not be limited to, the following:

Motors

Name of manufacturer.
Type and model.
Type of bearing and method of lubrication.
Rated size of motor, hp , and service factor.
Temperature rise and insulation rating.
Full load rotative speed.
Net weight.
Efficiency at full, 3/4, and 1/2 load.
Full load current.
Locked rotor current.
Space heater wattage, where applicable.
Motor temperature switch data, where applicable.
RTD data, where applicable.

Seismic Design Requirements

Confirmation of compliance with the requirements of the
Meteorological and Seismic Design Criteria section.

1-4. OPERATION AND MAINTENANCE DATA AND MANUALS. Adequate operation and maintenance information shall be supplied. Operation and maintenance manuals shall be submitted in accordance with the Greenbook Submittals section.

Operation and maintenance manuals shall include the following:

- a. Assembly, installation, alignment, adjustment, and checking instructions.
- b. Lubrication and maintenance instructions.
- c. Guide to troubleshooting.
- d. Parts lists and predicted life of parts subject to wear.
- e. Outline, cross-section, and assembly drawings; engineering data; and wiring diagrams.
- f. Test data and performance curves, where applicable.

PART 2 - PRODUCTS

2-1. SERVICE CONDITIONS. Service conditions for motors shall be as specified in the driven equipment Specification sections. Motors shall be designed for special conditions such as area classification, altitude, frequent starting, intermittent overload, high inertia, mounting configuration, or service environment. Where site elevation and ambient temperature is not specified in

the driven equipment Specification sections, the motors shall be designed for the following.

Site elevation	Below 3,300 ft
Ambient temperature	40 °C

Unless specified otherwise, all motors shall be designed for full voltage starting and to operate from an electrical system that may have a maximum of 5 percent voltage distortion according to IEEE 519.

Motors utilizing a reduced-voltage, autotransformer starter shall be capable of reduced-voltage starting at a 65 percent tap setting.

Motors utilizing a reduced voltage solid state starter shall be capable of starting at 50% of the specified voltage.

When powered from an adjustable frequency drive (AFD), motors shall be inverter duty and specifically selected for service with an adjustable frequency type speed controller and shall be derated as required to compensate for harmonic heating effects and reduced self-cooling capability at low speed operation. Each motor shall not exceed a Class B temperature rise when operating in the installed condition at load with power received from the adjustable frequency drive. All motors driven by AFDs shall be supplied with full phase insulation on the end turns and shall meet the requirements of NEMA MG 1, Part 31. In addition to the requirements of NEMA MG 1, Part 31, motors shall be designed to be continually pulsed at the motor terminals with a voltage of 1600 volts ac.

2-2. PERFORMANCE AND DESIGN REQUIREMENTS. Unless otherwise specified in the attached motor data sheet(s), design and construction of each general-purpose motor shall be as specified herein. Motor voltage, frequency, speed, service factor, and insulation class shall be as follows.

Motor voltage.	460, 3 phase for ½ horsepower and larger, 120, single phase for smaller than ½ horsepower
Frequency.	60 Hz
Speed.	Constant speed
Service factor.	1.0 , except for AFD driven motors which shall be 1.15
Insulation class and temperature rise above 40° C design ambient (by resistance method.	Class F with 80° C rise at 1.0 SF

Enclosure.
Main conduit box sized to include.

Totally enclosed fan cooled
Main motor leads and space heater leads where space heaters are specified

2-2.01. Nameplate Horsepower. Motor nameplate horsepower shall be equal to or greater than the maximum load imposed by the driven equipment.

2-2.02. Enclosures. All motors shall be self-ventilated. All self-ventilated open type motors, including those with dripproof, splashproof, and weather protected enclosures, and the fan covers of totally enclosed fan cooled motors shall meet NEMA MG 1 requirements for a fully guarded machine.

2-2.02.01. Totally Enclosed Motors. Totally enclosed motors shall be furnished with drain holes and rotating shaft seals. Frames, bearing brackets, external terminal housings, and fan covers for fan cooled motors shall be cast iron. External cooling fans for fan cooled motors shall be fabricated of brass, bronze, aluminum alloy containing not more than 0.2 percent copper, malleable iron, or plastic. All plastic fans shall be fabricated of a reinforced thermosetting plastic and shall be UL approved.

2-2.02.02. Outdoor Motors. Outdoor motors shall have NEMA weather protected enclosures. All exposed metal surfaces shall be protected, where practical, with a corrosion resistant polyester coating. Exposed uncoated surfaces shall be of a corrosion resistant metal. Enclosure exterior and interior surfaces, air gap surfaces, and windings shall be protected with a corrosion resistant polyester, polyurethane or epoxy coating.

2-2.02.03. Motors for Hazardous Locations. Motors for hazardous locations shall be in accordance with the NEC and of the correct type enclosures for the particular service as specified in NEMA MG 1. Motors shall meet the requirements of UL 674.

2-2.02.04. Encapsulated Windings. Motors indicated on the drawings to be located in a corrosive chemical areas shall be provided with encapsulated windings meeting the requirements of NEMA MG1-1.27.2.

2-2.02.05. Severe Duty Chemical Service Motors. Motors indicated on the drawings to be located in a corrosive chemical areas shall be provided with special corrosion-resistant finish and encapsulated windings meeting the requirements of NEMA MG1-1.27.2 and IEEE 841.

2-2.03. Main Conduit Boxes. The main conduit box shall be in accordance with NEMA MG 1. The main conduit boxes shall be diagonally split for easy access to

the motor leads, and designed for rotation in 90-degree increments. A gasket shall be furnished between the halves of the box. Conduit openings in the main conduit box shall match the size and quantity of conduits indicated on the one line Drawings.

The main conduit box shall be oversized at least one size larger than NEMA standard. The main conduit box shall be sized for all indicated accessory leads.

Motors furnished in NEMA 320 frame series and larger shall have conduit boxes designed and constructed to permit motor removal after installation without disconnecting raceways.

2-2.04. Leads. Motor power leads shall be wired into the main conduit box. Unless otherwise specified, space heater leads shall be wired into the main conduit box. All motor leads and their terminals shall be permanently marked in accordance with the requirements of NEMA MG 1, Part 2. Each lead marking shall be visible after taping of the terminals.

All motors rated 100 horsepower and larger, and all vertical motors shall have the direction of rotation marked by an arrow mounted visibly on the stator frame near the terminal housing, or on the nameplate, and the leads marked for phase sequence T1, T2, T3, to correspond to the direction of rotation and supply voltage sequence.

Leads for dual-voltage rated or for multispeed motors shall be easily connected or reconnected in the main conduit box for the operating voltage or for the specified speeds. Permanent instructions for making these connections shall be furnished inside the main conduit box or on the motor frame or nameplate.

2-2.05. Terminals. Cable type leads shall be provided with Burndy Type YA or acceptable equal compression type connectors.

2-2.06. Grounding Connections. All motors shall be furnished with a ground connection.

2-2.07. Bearings. All bearings shall be self-lubricating, shall have provisions for relubrication, and shall be designed to operate in any position or at any angle.

Motor bearings shall be antifriction type with L₁₀ life rating of 40,000 hours in accordance with ABMA Standards.

All bearing mountings shall be designed to prevent the entrance of lubricant into the motor enclosure or dirt into the bearings, and shall be fitted with pipes, drain

plugs, and fittings arranged for safe, easy relubrication from the outside of the motor while the motor is in service, as necessary.

2-2.08. Rotors. All induction motors shall have squirrel-cage rotors adequately sized to avoid overheating during acceleration of the motor and driven equipment. Rotors shall be dynamically balanced to 0.08 in./sec or less.

2-2.09. Shafts. Shafts shall be furnished with corrosion resistant treatment or shall be of a corrosion resistant material.

2-2.10. Torque Characteristics. Motors rated 200 horsepower and less shall have torques and locked-rotor current in accordance with NEMA MG 1, Part 12.

2-2.11. Motor Space Heaters. Unless otherwise specified in the attached motor data sheet(s), motors 1 horsepower and larger shall be provided with a space heater element sized to prevent condensation on the core and windings. The space heaters shall be isolated or so located as to prevent heat damage to adjacent painted surfaces and shall be suitable for 120 volt, 60 Hz, single phase power supply.

2-2.12. Temperature Sensing Devices. Not used.

2-2.13. Assembly. All motors shall be completely assembled with the driven equipment, lubricated, and ready for operation.

2-2.14. Efficiency. Unless otherwise specified in the attached motor data sheet(s), motors shall be premium efficiency type and shall have a NEMA nominal efficiency nameplate value equal to or greater than values indicated in the following table. Efficiency shall be determined in accordance with IEEE 112, Test Method B.

Vertical motors shall have efficiency values equal to or greater than those indicated in the following table minus 0.50.

Motor		Nominal Efficiency Values				Nominal Efficiency Values			
kW	hp	Open Drip Enclosure				TEFC Enclosure			
		3600 rpm	1800 rpm	1200 rpm	900 rpm	3600 rpm	1800 rpm	1200 rpm	900 rpm
0.7	1	84.0	85.5	82.5	75.0	77.0	85.5	82.5	75.5
1.1	1.5	84.0	86.5	86.5	78.0	84.0	86.5	87.5	80.0

Motor		Nominal Efficiency Values				Nominal Efficiency Values			
kW	hp	Open Drip Enclosure				TEFC Enclosure			
		3600 rpm	1800 rpm	1200 rpm	900 rpm	3600 rpm	1800 rpm	1200 rpm	900 rpm
1.5	2	85.5	86.5	87.5	86.5	85.5	86.5	88.5	85.5
2.2	3	85.5	89.5	88.5	89.5	87.0	89.5	89.5	86.5
3.7	5	86.5	89.5	89.5	89.5	88.5	89.5	89.5	85.5
5.6	7.5	88.5	91.0	90.2	88.5	90.0	91.7	91.0	86.5
7.5	10	89.5	91.7	91.7	91.0	91.0	91.7	91.0	91.0
11.2	15	90.2	93.0	91.7	91.0	91.0	92.4	92.0	91.0
14.9	20	91.7	93.0	92.4	92.0	92.0	93.0	92.0	91.0
18.7	25	92.4	93.6	93.0	92.0	92.0	93.6	93.0	91.0
22.4	30	93.0	94.1	93.6	93.0	92.4	93.6	93.0	93.0
29.8	40	93.0	94.1	94.1	93.0	92.4	94.1	94.1	93.0
37.3	50	93.0	94.5	94.1	93.0	93.0	94.5	94.1	93.0
44.8	60	93.6	95.0	94.5	94.0	93.6	95.0	94.5	93.0
56	75	94.0	95.0	95.0	94.0	93.6	95.4	95.0	94.0
74.6	100	94.5	95.4	95.0	95.0	94.1	95.4	95.0	94.0
93.2	125	95.0	95.4	95.0	95.0	95.0	95.4	95.0	94.0
112	150	95.0	95.8	95.4	95.0	95.0	95.8	95.8	94.0
149	200	95.4	95.8	95.4	95.0	95.4	96.2	95.8	94.1
186	250	95.0	95.8	95.4	95.0	95.8	96.2	95.8	94.5
224	300	95.4	95.8	95.4		95.8	96.2	95.8	
261	350	95.4	95.8	95.4		95.8	96.2	95.8	
298	400	95.8	95.8	95.8		95.8	96.2	95.8	
336	450	95.8	96.2	96.2		95.8	96.2	95.8	

NOVEMBER 2014
WBS NO. B10178
MBC CHEMICAL SYSTEMS IMPROVEMENTS – PHASE II

COMMON MOTOR REQ. FOR PROCESS EQUIP.
16220 - 7

Motor		Nominal Efficiency Values				Nominal Efficiency Values			
kW	hp	Open Drip Enclosure				TEFC Enclosure			
		3600 rpm	1800 rpm	1200 rpm	900 rpm	3600 rpm	1800 rpm	1200 rpm	900 rpm
373	500	95.8	96.2	96.2		95.8	96.2	95.8	

2-3. ACCESSORIES.

2-3.01. Special Tools and Accessories. Motors requiring periodic repair and adjustment shall be furnished complete with all special tools, instruments, and accessories required for proper maintenance. Each motor shall be provided with lifting eyebolts or lugs and appropriate fittings for adding bearing lubricant. Grease lubricated units shall be provided with a means of venting the casing. Oil lubricated units shall be provided with constant level oilers or with sight glasses arranged to indicate operating and static oil levels.

2-4. ANCHORS. Contractor shall furnish suitable anchors for each item of equipment as required for driven equipment.

2-5. BALANCE. 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 resonance at normal operating speeds is avoided. In any case, the unfiltered vibration displacement (peak-to-peak), as measured at any point on the machine, shall not exceed the limits as required. At any operating speed, the ratio of rotative speed to the critical speed of a unit or its components shall be less than 0.8 or more than 1.3.

PART 3 - EXECUTION

3-1. INSTALLATION. Each motor shall be installed in accordance with the Equipment Installation section.

End of Section

SUPPLEMENTARY SPECIAL PROVISIONS

APPENDICES

APPENDIX A

Materials Typically Accepted by Certificate of Compliance

Materials Typically Accepted by Certificate of Compliance

1. Soil amendment
2. Fiber mulch
3. PVC or PE pipe up to 16 inch diameter
4. Stabilizing emulsion
5. Lime
6. Preformed elastomeric joint seal
7. Plain and fabric reinforced elastomeric bearing pads
8. Steel reinforced elastomeric bearing pads
9. Waterstops (Special Condition)
10. Epoxy coated bar reinforcement
11. Plain and reinforcing steel
12. Structural steel
13. Structural timber and lumber
14. Treated timber and lumber
15. Lumber and timber
16. Aluminum pipe and aluminum pipe arch
17. Corrugated steel pipe and corrugated steel pipe arch
18. Structural metal plate pipe arches and pipe arches
19. Perforated steel pipe
20. Aluminum underdrain pipe
21. Aluminum or steel entrance tapers, pipe downdrains, reducers, coupling bands and slip joints
22. Metal target plates
23. Paint (traffic striping)
24. Conductors
25. Painting of electrical equipment
26. Electrical components
27. Engineering fabric
28. Portland Cement
29. PCC admixtures
30. Minor concrete, asphalt
31. Asphalt (oil)
32. Liquid asphalt emulsion
33. Epoxy

APPENDIX B
SAMPLE CITY INVOICE

City of San Diego, Field Engineering Div., 9485 Aero Drive, SD CA 92123						Contractor's Name:					
Project Name:						Contractor's Address:					
SAP No. (WBS/IO/CC):											
City Purchase Order No. :						Contractor's Phone #:			Invoice No.		
Resident Engineer (RE):						Contractor's Fax #:			Invoice Date:		
RE Phone#:			RE Fax#:			Contact Name:			Billing Period:		
Item #	Item Description	Contract Authorization				Previous Estimate		This Estimate		Totals to Date	
		Unit	Qty	Price	Extension	%/QTY	Amount	%/QTY	Amount	%/QTY	Amount
1	2 Parallel 4" PVC C900	LF	1,380	\$34.00	\$46,920.00						
2	48" Primary Steel Casing	LF	500	\$1,000.00	\$500,000.00						
3	2 Parallel 12" Secondary Steel	LF	1,120	\$53.00	\$59,360.00						
4	Construction and Rehab of PS 49	LS	1	\$150,000.00	\$150,000.00						
5	Demo	LS	1	\$14,000.00	\$14,000.00						
6	Install 6' High Chain Link Fence	LS	1	\$5,600.00	\$5,600.00						
7	General Site Restoration	LS	1	\$3,700.00	\$3,700.00						
8	10" Gravity Sewer	LF	10	\$292.00	\$2,920.00						
9	4" Blow Off Valves	EA	2	\$9,800.00	\$19,600.00						
10	Bonds	LS	1	\$16,000.00	\$16,000.00						
11	Field Orders	AL	1	80,000	\$80,000.00						
11.1	Field Order 1	LS	5,500	\$1.00	\$5,500.00						
11.2	Field Order 2	LS	7,500	\$1.00	\$7,500.00						
11.3	Field Order 3	LS	10,000	\$1.00	\$10,000.00						
11.4	Field Order 4	LS	6,500	\$1.00	\$6,500.00						
12	Certified Payroll	LS	1	\$1,400.00	\$1,400.00						
CHANGE ORDERS											
Change Order 1			4,890								
Items 1-4					\$11,250.00						
Item 5-Deduct Bid Item 3		LF	120	-\$53.00	(\$6,360.00)						
Change Order 2			160,480								
Items 1-3					\$95,000.00						
Item 4 Deduct Bid Item 1		LF	380	-\$340.00	(\$12,920.00)						
Item 5-Increase bid Item 9		LF	8	\$9,800.00	\$78,400.00						
Change Order 3 (Close Out)			-121,500								
Item 1 Deduct Bid Item 3			53	-\$500.00	(\$26,500.00)						
Item 2 Deduct Bid Item 4		LS	-1	45,000.00	(\$45,000.00)						
Items 3-9			1	-50,500.00	(\$50,500.00)						
SUMMARY								Total This	\$ -	Total Billed	\$0.00
A. Original Contract Amount						Retention and/or Escrow Payment Schedule					
B. Approved Change Order 1 Thru 3						Total Retention Required as of this billing					
C. Total Authorized Amount (A+B)						Previous Retention Withheld in PO or in Escrow					
D. Total Billed to Date						Add'l Amt to Withhold in PO/Transfer in Escrow:					
E. Less Total Retention (5% of D)						Amt to Release to Contractor from PO/Escrow:					
F. Less Total Previous Payments											
G. Payment Due Less Retention						Contractor Signature and Date:					
H. Remaining Authorized Amount											

APPENDIX C

NOTICE OF EXEMPTION / ENVIRONMENTAL FILING FEE

NOTICE OF EXEMPTION

(Check one or both)

TO: X RECORDER/COUNTY CLERK
P.O. BOX 1750, MS A-33
1600 PACIFIC HWY, ROOM 260
SAN DIEGO, CA 92101-2422
OFFICE OF PLANNING AND RESEARCH
1400 TENTH STREET, ROOM 121
SACRAMENTO, CA 95814

FROM: CITY OF SAN DIEGO
DEVELOPMENT SERVICES DEPARTMENT
1222 FIRST AVENUE, MS 501
SAN DIEGO, CA 92101
FILED IN THE OFFICE OF THE COUNTY CLERK
San Diego County on NOV 29 2011
Posted NOV 29 2011
Returns to agency on
Deputy L. Kesian

PROJECT No.: WBS B-10178

PROJECT TITLE: MBC Chemical System Improvements Phase II

PROJECT LOCATION-SPECIFIC: The project is located within the Area 60- Chemical Building at the Metro Biosolids Center located at 5240 Convoy Street.

PROJECT LOCATION-CITY/COUNTY: City of San Diego/ County of San Diego.

DESCRIPTION OF NATURE AND PURPOSE OF THE PROJECT: The project involves relocating and installing new mechanical equipment, above ground piping and electrical components associated with the chemical systems located within the Chemical Building within the treatment plant site Area 60. Improvements to the chemical system include relocating valve actuators, three emergency eyewash showers, chemical piping and electrical conduit, installing new platforms to access valve actuators, new multi-level flood sensors in the spill containment cells, upgrades to ferric chloride feed pumps and associated improvements. All construction access will use existing paved roads within the treatment plant and the new chemical equipment will be entirely contained within the existing Chemical Building. No excavation will be required for installation of the new equipment.

NAME OF PUBLIC AGENCY APPROVING PROJECT: City of San Diego

NAME OF PERSON OR AGENCY CARRYING OUT PROJECT: City of San Diego, E&CP Dept/Manuel Da Rosa
600 B Street, Suite 800 (MS 908A)
San Diego, CA 92101
619 533-4629

EXEMPT STATUS: (CHECK ONE)

- () MINISTERIAL (SEC. 21080(b)(1); 15268);
(X) CATEGORICAL EXEMPTION: 15302 (REPLACEMENT OR RECONSTRUCTION)

REASONS WHY PROJECT IS EXEMPT: The City of San Diego conducted an Initial Study which determined that this project does not involve significant impacts to any resources under CEQA. The project proposes to replace existing mechanical and electrical equipment within the same building located within the developed treatment plant. This project meets the criteria set forth in CEQA Section 15302 which allows for replacement of existing utilities with substantially the same purpose and capacity and where exceptions listed in CEQA Section 15300.2 would not apply.

LEAD AGENCY CONTACT PERSON: MARTHA BLAKE

TELEPHONE: (619) 446-5375

IT IS HEREBY CERTIFIED THAT THE CITY OF SAN DIEGO HAS DETERMINED THE ABOVE ACTIVITY TO BE EXEMPT FROM CEQA.

Signature of Martha Blake, Senior Planner

November 14, 2011
DATE

SIGNATURE/TITLE

CHECK ONE:

(X) SIGNED BY LEAD AGENCY

FILED
Ernest J. Dronenburg, Jr., Recorder County Clerk

DATE RECEIVED FOR FILING WITH COUNTY CLERK OR OPR:

NOV 29 2011



Ernest J. Dronenburg, Jr.

COUNTY OF SAN DIEGO ASSESSOR/RECORDER/COUNTY CLERK

**ASSESSOR'S OFFICE**

1600 Pacific Highway, Suite 103
San Diego, CA 92101-2480
Tel. (619) 236-3771 * Fax (619) 557-4056

www.sdarcc.com

RECORDER/COUNTY CLERK'S OFFICE

1600 Pacific Highway, Suite 260
P.O. Box 121750 * San Diego, CA 92112-1750
Tel. (619) 237-0502 * Fax (619) 557-4155

Transaction #: 261297320111129

Deputy: LKESIAN

Location: COUNTY ADMINISTRATION BUILDING

29-Nov-2011 16:34

FEES:

50.00 Qty of 1 Fee Notice of Exemption for Ref# NOE: 1016

50.00 TOTAL DUE

PAYMENTS:

50.00 Check

50.00 TENDERED

**SERVICES AVAILABLE AT
OFFICE LOCATIONS**

- * Tax Bill Address Changes
- * Records and Certified Copies:
Birth/ Marriage/ Death/ Real Estate
- * Fictitious Business Names (DBAs)
- * Marriage Licenses and Ceremonies
- * Assessor Parcel Maps
- * Property Ownership
- * Property Records
- * Property Values
- * Document Recordings

SERVICES AVAILABLE ON-LINE AT

www.sdarcc.com

- * Forms and Applications
- * Frequently Asked Questions (FAQs)
- * Grantor/ Grantee Index
- * Fictitious Business Names Index (DBAs)
- * Property Sales
- * On-Line Purchases
Assessor Parcel Maps
Property Characteristics
Recorded Documents

ATTACHMENT F
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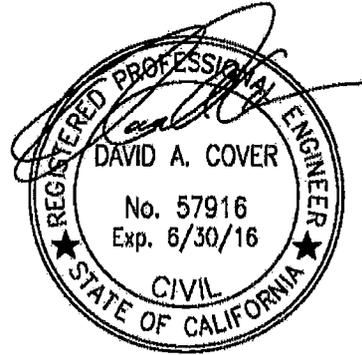
ENGINEER OF WORK

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

David A. Cover
1) Registered Engineer

4/16/2015
Date

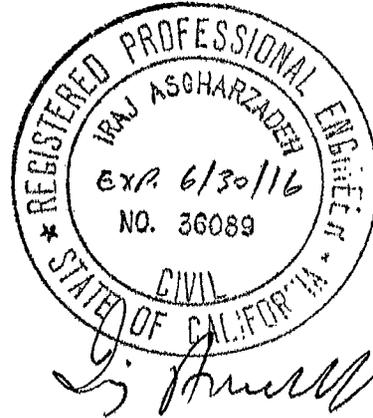
Seal:



Iraj Asgharzadeh
2) For City Engineer

4-16-15
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. Can additional site visits be arranged for primes and subcontractors? Who should be the point of contact for arranging such visits?

A1. One additional site visit will be conducted on April 27, 2015 at 1:30 PM The City point of contact is the project manager Idalmiro Manny Da Rosa, phone number (619) 533-4629 or IMdaRosa@sandiego.gov.

Q2. Section views are not available for many of the chemical tanks in Area 60. Can square footages be provided for the areas of floor and wall to be blasted and recoated? Alternatively, could you verify that each of the containment walls are 5.5ft in height and each tank pad is 3.0ft thick? If the wall heights and pad thicknesses are not uniform, could you provide the correct dimensions for each containment area?

A2. Basin areas, wall heights and tank (concrete) pad height for each containment area are provided in the table below. Table values are approximate.

Chemical Area	Tank Tag No.	Basin area ⁽¹⁾ (ft ²)	Floor elevation (ft)	Top of tank concrete pad (ft)	Top of containment wall (ft)
CS	60-T-41 & 42	330	407	410	412.5
HOS	60-T-61 & 62	333	407	410	412.5
SHT	60-T-51 & 52	469	407	410	412.5
FC2	60-T-81 & 82	469	407	410	412.5
FC3	60-T-71 & 72	400 & 416	407	410	412.5
POL	60-T-1 & 2	352 & 340	407	410	412.5
	60-T-11, 12, 13 & 14	352, 340, 417 & 402	407	410	412.5
POL MIX	60-T-21, 22, 23 & 24	628	407.5	410	412.5
Tanks	NA	460	407	410	412.5

(1) Basin length by width from inside of wall to inside of wall.

Q3. For bidding purposes, could you provide a quantity of spot repairs and/or square footage of estimated areas of existing damaged coatings within the interior chemical building containment basins?

A3. For bidding purposes, the areas below shall be used.

Improvement area	Approximate spot repair area (ft ²)
Area 60	1,415
Area 76	305
Area 80	300

Q4. Specification Section 15067 2-3.02 dictates that double contained feed pipe shall be a **“Prefabricated system consisting of primary pipe supported within secondary containment piping.”** Prefabricated double contained pipe systems are significantly more expensive than equivalent double contained systems that are field assembled with the same spacers. Please clarify if the owner intends to enforce the “prefabricated system” requirement on the double contained straight pipe, the fittings, or both.

A4. Prefabricated system requirement will be enforced on all straight pipe and fittings. Field assembled double contained piping will not be accepted.

Q5. Please clarify the limits of double containment required with respect to Area 60 Ferric Chloride and Ferrous Chloride overhead piping and valves. Note 1 on Dwg 60-M-31A and Note 2 on Dwg 60-M-122A say that **“All overhead ferrous/ferric chloride piping, valves, and fittings shall be double wall contained material.”** It’s unclear exactly to which sections of piping, and more importantly, which if any of the valves this requirement applies to. Please provide additional direction, perhaps on 60-M-215 Section 3, as to where the transition to double containment is expected to occur.

A5. Limits are described in the following Contract Documents. Refer to attached pages 39 through 42 of this Addendum.

- DWG 60-M-112A: Note 1, 5 and 8
- DWG 60-M-117A: Note 4
- DWG 60-M-122A: Note 2
- DWG 60-M-215: Note 4

See color highlighted drawings attached for additional clarification.

Drawings attached are:

1. DWG 60-M-112A
2. DWG 60-M-117A
3. DWG 60-M-122A
4. DWG 60-M-215

Ferrous and ferric chloride double contained pipe segments are highlighted in yellow. Other double contained chemical piping required in Area 60 is highlighted in orange.

C. VOLUME 1

1. To Attachment D, CLEAN WATER STATE REVOLVING FUND (CWSRF), Funding Agency Provisions, page 45, Item 9, WAGE RATES, **DELETE** in its entirety and **SUBSTITUTE** with the following:

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

General Decision Number: CA150001 03/27/2015 CA1

Superseded General Decision Number: CA20140001

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: Executive Order (EO) 13658 establishes an hourly minimum wage of \$10.10 for 2015 that applies to all contracts subject to the Davis-Bacon Act for which the solicitation is 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 \$10.10 (or the applicable wage rate listed on this wage determination, if it

is higher) for all hours spent performing on the contract. 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	01/02/2015
1	01/16/2015
2	02/13/2015
3	03/27/2015

ASBE0005-002 06/30/2014

	Rates	Fringes
Asbestos Workers/Insulator (Includes the application of all insulating materials, protective coverings, coatings, and finishes to all types of mechanical systems).....	\$ 35.44	19.36
Fire Stop Technician (Application of Firestopping Materials for wall openings and penetrations in walls, floors, ceilings and curtain walls).....	\$ 24.34	16.09

ASBE0005-004 06/24/2013

	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)....	\$ 16.95	10.23

BOIL0092-003 10/01/2012

Rates	Fringes
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BOILERMAKER.....\$ 41.17 28.27

BRCA0004-008 11/01/2014

Rates Fringes

BRICKLAYER; MARBLE SETTER.....\$ 34.12 15.65

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 12/01/2014

Rates Fringes

Electricians (Tunnel Work)

Cable Splicer.....	\$ 45.75	13.25
Electrician.....	\$ 45.00	13.22

Electricians: (All Other
Work, Including 4 Stories
Residential)

Cable Splicer.....	\$ 40.75	13.10
Electrician.....	\$ 40.00	13.07

 ELEC0569-005 09/01/2014

Rates Fringes

Sound & Communications

Sound Technician.....	\$ 28.82	3%+10.81
Soundman.....	\$ 23.06	3%+ 9.17

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

SOUNDMAN: Wire-pulling, splicing, assembling and installing devices

SCOPE OF WORK Assembly, installation, operation, service and maintenance of components or systems as used in closed circuit television, amplified master television distribution, CATV on private property, intercommunication, burglar alarm, fire alarm, life support and all security alarms, private and public telephone and related telephone interconnect, public address, paging, audio, language, electronic, background music system less than line voltage or any system acceptable for class two wiring for private, commercial, or industrial use furnished by leased wire, frequency modulation or other recording devices, electrical apparatus by means of which electricity is applied to the amplification, transmission, transference, recording or reproduction of voice, music, sound, impulses and video. Excluded from this Scope of Work - transmission, service and maintenance of background music. All of the above shall include the installation and transmission over fiber optics.

ELEC0569-006 10/06/2014

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.....	\$ 28.75	3%+7.42
Utility Technician #2.....	\$ 23.90	3%+7.42

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 06/03/2013

	Rates	Fringes
ELECTRICIAN (Residential, 1-3 Stories).....	\$ 22.37	3%+3.30

 ELEC1245-001 06/01/2013

	Rates	Fringes
LINE CONSTRUCTION		
(1) Lineman; Cable splicer..	\$ 50.30	15.00
(2) Equipment specialist (operates crawler tractors, commercial motor vehicles, backhoes, trenchers, cranes (50 tons and below), overhead & underground distribution line equipment).....	\$ 40.17	14.56
(3) Groundman.....	\$ 30.73	13.48
(4) Powderman.....	\$ 44.91	13.48

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

 * ELEV0018-001 01/01/2015

Rates	Fringes
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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 07/07/2014

Rates Fringes

OPERATOR: Power Equipment
(All Other Work)

GROUP 1.....	\$ 39.05	22.25
GROUP 2.....	\$ 39.83	22.25
GROUP 3.....	\$ 40.12	22.25
GROUP 4.....	\$ 41.61	22.25
GROUP 5.....	\$ 41.86	22.25
GROUP 6.....	\$ 41.83	22.25
GROUP 8.....	\$ 41.94	22.25
GROUP 9.....	\$ 42.19	22.25
GROUP 10.....	\$ 42.06	22.25
GROUP 11.....	\$ 42.31	22.25
GROUP 12.....	\$ 42.23	22.25
GROUP 13.....	\$ 42.33	22.25
GROUP 14.....	\$ 42.36	22.25
GROUP 15.....	\$ 42.44	22.25
GROUP 16.....	\$ 42.56	22.25
GROUP 17.....	\$ 42.73	22.25
GROUP 18.....	\$ 42.83	22.25
GROUP 19.....	\$ 42.94	22.25
GROUP 20.....	\$ 43.06	22.25
GROUP 21.....	\$ 43.23	22.25
GROUP 22.....	\$ 43.33	22.25
GROUP 23.....	\$ 43.44	22.25
GROUP 24.....	\$ 43.56	22.25
GROUP 25.....	\$ 43.73	22.25

OPERATOR: Power Equipment
(Cranes, Piledriving &
Hoisting)

GROUP 1.....	\$ 40.40	22.25
GROUP 2.....	\$ 41.18	22.25

GROUP 3.....	\$ 41.47	22.25
GROUP 4.....	\$ 41.61	22.25
GROUP 5.....	\$ 41.83	22.25
GROUP 6.....	\$ 41.94	22.25
GROUP 7.....	\$ 42.06	22.25
GROUP 8.....	\$ 42.23	22.25
GROUP 9.....	\$ 42.40	22.25
GROUP 10.....	\$ 43.40	22.25
GROUP 11.....	\$ 44.40	22.25
GROUP 12.....	\$ 45.40	22.25
GROUP 13.....	\$ 46.40	22.25

OPERATOR: Power Equipment
(Tunnel Work)

GROUP 1.....	\$ 40.90	22.25
GROUP 2.....	\$ 41.68	22.25
GROUP 3.....	\$ 41.97	22.25
GROUP 4.....	\$ 42.11	22.25
GROUP 5.....	\$ 42.33	22.25
GROUP 6.....	\$ 42.44	22.25
GROUP 7.....	\$ 42.56	22.25

PREMIUM PAY:

\$3.75 per hour shall be paid on all Power Equipment Operator work on the following 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 (guniting 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 bending 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, PILEDIVING 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 which 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 08/01/2014

	Rates	Fringes
OPERATOR: Power Equipment		
(DREDGING)		
(1) Leverman.....	\$ 48.60	22.40
(2) Dredge dozer.....	\$ 42.63	22.40
(3) Deckmate.....	\$ 42.52	22.40
(4) Winch operator (stern winch on dredge).....	\$ 41.97	22.40
(5) Fireman-Oiler, Deckhand, Bargeman, Leveehand.....	\$ 41.43	22.40
(6) Barge Mate.....	\$ 42.04	22.40

IRON0377-002 01/01/2015

	Rates	Fringes
Ironworkers:		
Fence Erector.....	\$ 27.08	18.24
Ornamental, Reinforcing and Structural.....	\$ 33.50	28.20

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 07/01/2013

	Rates	Fringes
LABORER (BUILDING and all other Residential Construction)		
Group 1.....	\$ 26.98	15.42
Group 2.....	\$ 27.66	15.42
Group 3.....	\$ 28.37	15.42
Group 4.....	\$ 29.17	15.42
Group 5.....	\$ 31.10	15.42
LABORER (RESIDENTIAL CONSTRUCTION - See definition below)		

(1) Laborer.....	\$ 24.88	13.75
(2) Cleanup, Landscape, Fencing (Chain Link & Wood).	\$ 23.59	13.75

RESIDENTIAL DEFINITION: Wood or metal frame construction of single family residences, apartments and condominiums - 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, multi-plate; Kettlemen, potmen and men 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, vibrating 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 including rubber gasket joints, pointing and any and all other services; Rotary Scarifier or multiple head concrete chipping scarifier; Steel header board man and guideline setter; Tampers, Barko, Wacker and similar type; Trenching machine, handpropelled

GROUP 4: Asphalt raker, luterman, ironer, asphalt 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 operation, 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 (nozzlemán), Porta shot-blast, water blasting

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; 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 11/01/2012

	Rates	Fringes
LABORER (MASON TENDER).....	\$ 27.98	13.39

LABO0089-004 07/01/2013

HEAVY AND HIGHWAY CONSTRUCTION

	Rates	Fringes
Laborers:		
Group 1.....	\$ 26.98	15.42
Group 2.....	\$ 27.66	15.42
Group 3.....	\$ 28.37	15.42
Group 4.....	\$ 29.17	15.42
Group 5.....	\$ 31.10	15.42

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, Prefabricated Manhole Installer, Sandblast Nozzleman (Water Blasting-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 tracking, 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 01/01/2014

	Rates	Fringes
Asbestos Removal Laborer.....	\$ 28.00	15.25

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 07/01/2014

	Rates	Fringes
Laborers: (HORIZONTAL DIRECTIONAL DRILLING)		
(1) Drilling Crew Laborer...	\$ 31.65	13.33
(2) Vehicle Operator/Hauler.	\$ 31.82	13.33
(3) Horizontal Directional		

Drill Operator.....	\$ 33.67	13.33
(4) Electronic Tracking Locator.....	\$ 35.67	13.33
Laborers: (STRIPING/SLURRY SEAL)		
GROUP 1.....	\$ 32.56	16.28
GROUP 2.....	\$ 33.86	16.28
GROUP 3.....	\$ 35.87	16.28
GROUP 4.....	\$ 37.61	16.28

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

LABO1414-003 08/07/2013

Rates Fringes

LABORER

PLASTER CLEAN-UP LABORER....	\$ 27.45	16.36
PLASTER TENDER.....	\$ 30.00	16.36

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 07/01/2014

Rates Fringes

Painters: (Including Lead Abatement)

(1) Repaint (excludes San Diego County).....	\$ 26.89	12.28
(2) All Other Work.....	\$ 30.27	12.28

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 10/01/2014

Rates Fringes

DRYWALL FINISHER/TAPER

(1) Building & Heavy Construction.....	\$ 26.84	14.29
(2) Residential Construction (Wood frame apartments, single family homes and multi-duplexes		

up to and including four stories).....\$ 21.00 13.91

PAIN0036-012 12/01/2014

Rates Fringes
GLAZIER.....\$ 39.80 17.33

PAIN0036-019 07/01/2014

Rates Fringes
SOFT FLOOR LAYER.....\$ 26.77 12.75

PLAS0200-005 08/06/2014

Rates Fringes
PLASTERER.....\$ 37.43 13.28

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

PLAS0500-001 07/01/2014

Rates Fringes
CEMENT MASON/CONCRETE FINISHER
GROUP 1.....\$ 22.29 17.10
GROUP 2.....\$ 23.94 17.10
GROUP 3.....\$ 26.57 17.25

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 07/01/2014

	Rates	Fringes
PLUMBER, PIPEFITTER, STEAMFITTER		
Camp Pendleton.....	\$ 49.21	20.36
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.....	\$ 44.71	20.36
Work ONLY on new additions and remodeling of commercial buildings, bars, restaurants, and stores not to exceed 5,000 sq. ft. of floor space.....	\$ 43.33	19.38
Work ONLY on strip malls, light commercial, tenant improvement and remodel work.....	\$ 34.59	17.71

PLUM0016-011 07/01/2014

	Rates	Fringes
PLUMBER/PIPEFITTER		
Residential.....	\$ 36.15	16.28

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 07/01/2013

	Rates	Fringes
SPRINKLER FITTER.....	\$ 34.86	18.66

SHEE0206-001 01/01/2012

	Rates	Fringes
SHEET METAL WORKER		
Camp Pendleton.....	\$ 35.05	19.23
Except Camp Pendleton.....	\$ 33.05	19.23
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 07/01/2012

	Rates	Fringes
Truck drivers:		
GROUP 1.....	\$ 15.40	20.50
GROUP 2.....	\$ 24.99	20.50
GROUP 3.....	\$ 25.19	20.50

GROUP 4.....	\$ 25.39	20.50
GROUP 5.....	\$ 25.59	20.50
GROUP 6.....	\$ 26.09	20.50
GROUP 7.....	\$ 27.59	20.50

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

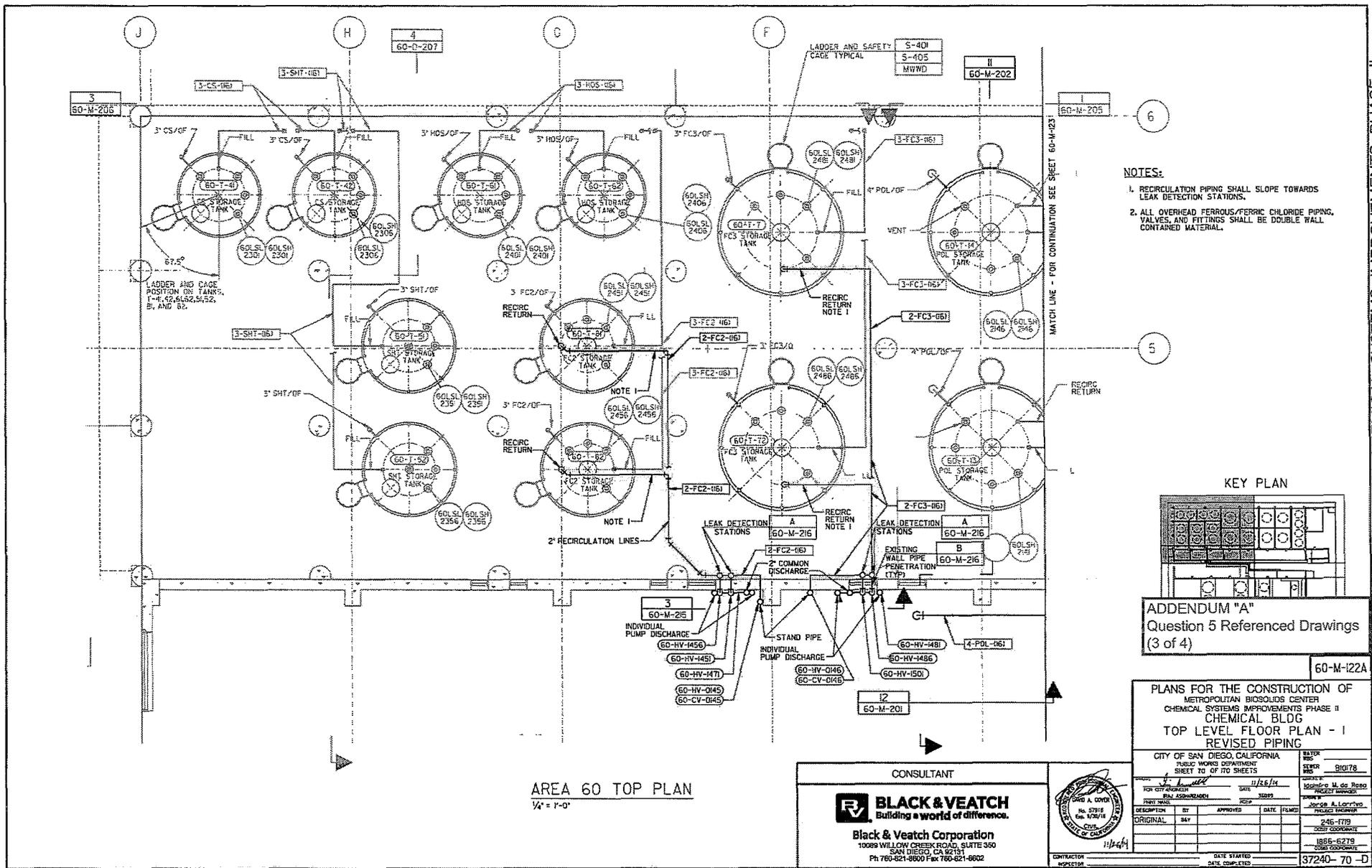
4.) All decisions by the Administrative Review Board are final.

END OF GENERAL DECISION

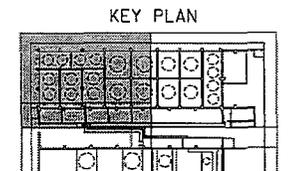
James Nagelvoort, Director
Public Works Department

Dated: *April 16, 2015*
San Diego, California

JN/RWB/Lad



- NOTES:**
1. RECIRCULATION PIPING SHALL SLOPE TOWARDS LEAK DETECTION STATIONS.
 2. ALL OVERHEAD FERROUS/FERRIC CHLORIDE PIPING, VALVES, AND FITTINGS SHALL BE DOUBLE WALL CONTAINED MATERIAL.



ADDENDUM "A"
 Question 5 Referenced Drawings
 (3 of 4)

60-M-122A

PLANS FOR THE CONSTRUCTION OF METROPOLITAN BIOSOLIDS CENTER CHEMICAL SYSTEMS IMPROVEMENTS PHASE II CHEMICAL BLDG TOP LEVEL FLOOR PLAN - I REVISED PIPING

CITY OF SAN DIEGO CALIFORNIA PUBLIC WORKS DEPARTMENT SHEET 70 OF 170 SHEETS		WATER REVISION SEWER REVISION SHEET NO.
DATE: 11/26/14	BY: [Signature]	NO. 57815 REV. 1/20/14
FOR CITY ENGINEER: [Signature]	DATE: 11/26/14	DESIGNED BY: [Signature]
FOR CITY MANAGER: [Signature]	DATE: 11/26/14	CHECKED BY: [Signature]
PROJECT NO. 1856-6279	PROJECT NAME: 246-FTFS	CONTRACT NO. 1856-6279
CONTRACTOR: [Signature]	DATE STARTED: [Blank]	DATE COMPLETED: [Blank]
CONTRACTOR NO. 37240-70-D		Page 41 of 42

AREA 60 TOP PLAN
 1/4" = 1'-0"

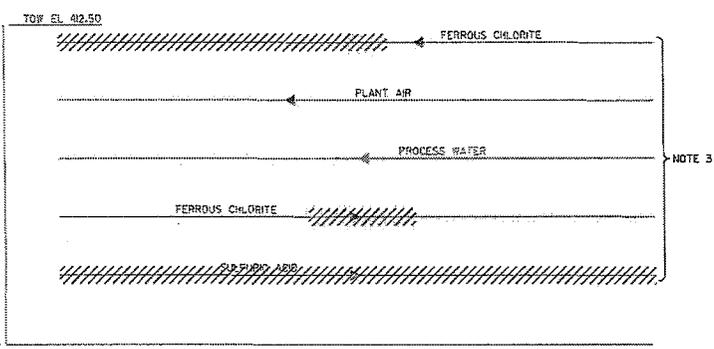
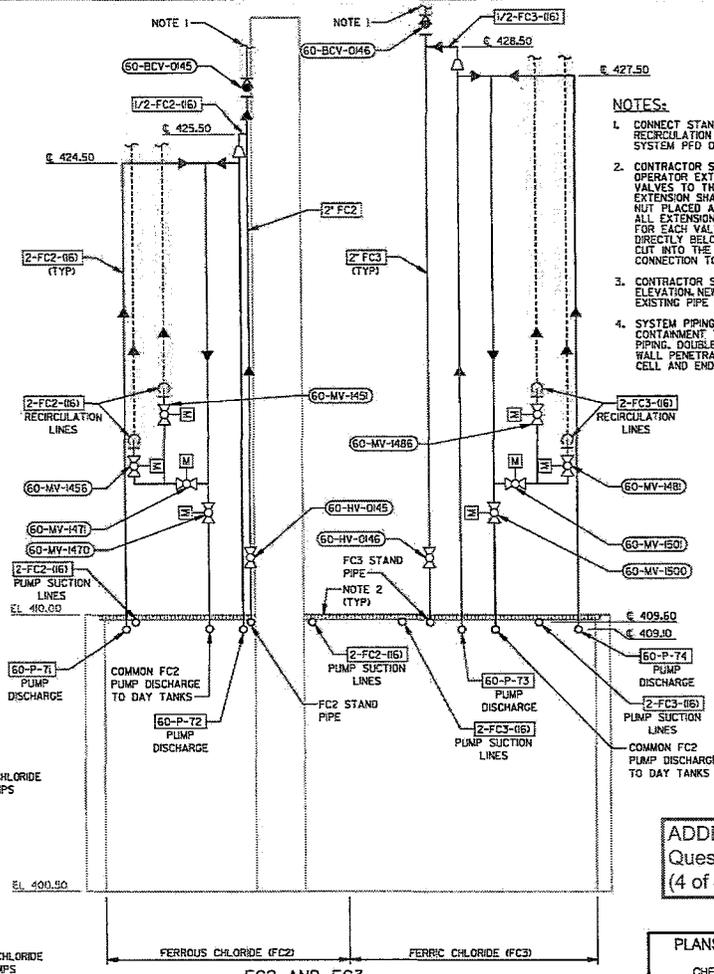
CONSULTANT

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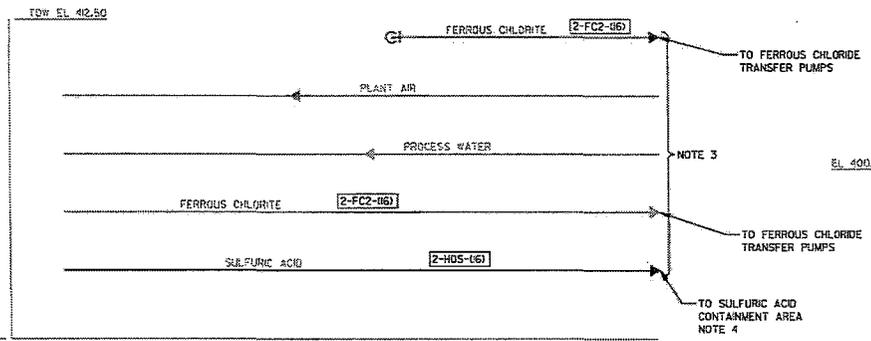
Black & Veatch Corporation
 10089 WILLOW CREEK ROAD, SUITE 350
 SAN DIEGO, CA 92178
 PH: 760-621-9900 FAX: 760-621-9602



- NOTES:**
- CONNECT STAND PIPE VENTS TO ITS RESPECTIVE RECIRCULATION LINE ON OTHER SIDE OF WALL PER SYSTEM PFD ON DWG 60-M-3L
 - CONTRACTOR SHALL PROVIDE AND INSTALL MANUAL OPERATOR EXTENSION FROM ALL NEW AND EXISTING VALVES TO THE FRP GRATING LEVEL. OPERATOR EXTENSION SHALL INCLUDE A 2-INCH OPERATOR NUT PLACED AT THE FRP GRATING LEVEL. INSTALL ALL EXTENSION GUIDES AND SUPPORTS AS NECESSARY FOR EACH VALVE. FOR OPERATOR EXTENSIONS DIRECTLY BELOW FRP GRATING, A HOLE SHALL BE CUT INTO THE GRATING LARGE ENOUGH TO PROVIDE CONNECTION TO THE NUT WITH A VALVE NUT WRENCH.
 - CONTRACTOR SHALL FIELD VERIFY EXISTING PIPING ELEVATION. NEW PIPING SHALL MAINTAIN AND KEEP EXISTING PIPE ELEVATION.
 - SYSTEM PIPING RUNNING THROUGH FERROUS CHLORIDE CONTAINMENT TANK SHALL BE DOUBLE WALL CONTAINED PIPING. DOUBLE WALL PIPE SHALL START PRIOR TO PIPE WALL PENETRATION TO FERROUS CHLORIDE CONTAINMENT CELL AND END IN THE SYSTEM'S PUMP CONTAINMENT AREA.



FERROUS BULK STORAGE TANK CONTAINMENT AREA DEMO
 1
 1/4" = 1'-0"
 60-D-02



FERROUS BULK STORAGE TANK CONTAINMENT AREA
 2
 1/4" = 1'-0"
 60-M-02

FC2 AND FC3 TRANSFER PUMPS
 3
 1/8" = 1'-0"
 60-M-07

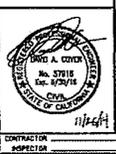
ADDENDUM "A"
 Question 5 Referenced Drawings
 (4 of 4)

PLANS FOR THE CONSTRUCTION OF METROPOLITAN BIOSOLIDS CENTER CHEMICAL SYSTEMS IMPROVEMENTS PHASE II MECHANICAL SECTION - 15 REVISED PIPING

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 10088 WILLOW CREEK ROAD, SUITE 350
 SAN DIEGO, CA 92131
 Ph 760-621-9600 Fax 760-621-9802



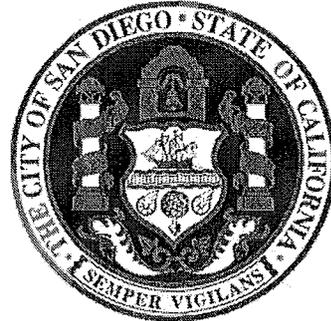
CITY OF SAN DIEGO, CALIFORNIA PUBLIC WORKS DEPARTMENT SHEET 78 OF 170 SHEETS		DATE: 11/21/14	BY: JLM	APPROVED: JLM
DESIGNER: JLM	DATE: 11/21/14	BY: JLM	APPROVED: JLM	DATE: 11/21/14
PROJECT NO: 1585-0279	CONTRACT NO: 1585-0279	CONTRACTOR: 37240-78-D	DATE STARTED:	DATE COMPLETED:

City of San Diego

CITY CONTACT: Eleida Felix-Yackel, Email: EFelixYackel@sandiego.gov
Phone No. (619) 533-3449, Fax No. (619) 533-3633

ADDENDUM "B"

FOR



MBC - Chemical System Improvements - Phase II

BID NO.: K-15-6231-DBB-3
SAP NO. (WBS/IO/CC): B-10178
CLIENT DEPARTMENT: 2011
COUNCIL DISTRICT: 7
PROJECT TYPE: BO

BID DUE DATE:

2:00 PM

JUNE 9, 2015

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: *May 5, 2015*
San Diego, California

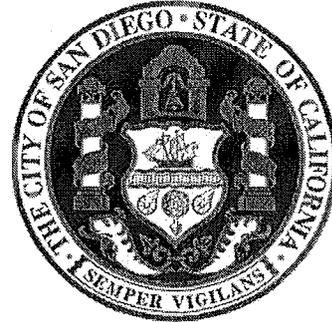
JN/RWB/Lad

City of San Diego

CITY CONTACT: Eleida Felix Yackel, Email: EFelixYackel@sandiego.gov
Phone No. (619) 533-3449, Fax No. (619) 533-3633

ADDENDUM "C"

FOR



MBC - Chemical System Improvements - Phase II

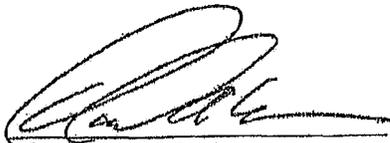
BID NO.: K-15-6231-DBB-3
SAP NO. (WBS/IO/CC): B-10178
CLIENT DEPARTMENT: 2011
COUNCIL DISTRICT: 7
PROJECT TYPE: BO

BID DUE DATE:

2:00 PM
JUNE 9, 2015
CITY OF SAN DIEGO
PUBLIC WORKS CONTRACTS
1010 SECOND AVENUE, 14th FLOOR, MS 614C
SAN DIEGO, CA 92101

ENGINEER OF WORK

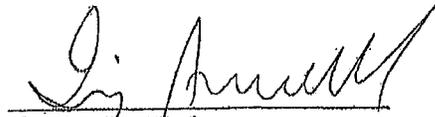
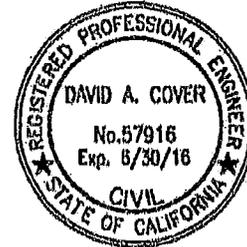
The engineering Specifications and Special Provisions contained herein have been prepared by or under the direction of the following Registered Engineer:



1) Registered Engineer

5/7/15
Date

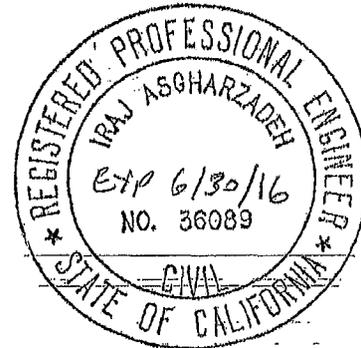
Seal:



2) For City Engineer

5/7/15
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.

B. BIDDER'S QUESTIONS

Q1. Is a coating required for the structural beams for the new catwalk in the Area 60 Chemical Storage Tank Farm?

A1. Galvanized surfaces including the structural beams shall be coated per Technical Specification Section 09940, Part 3-9 (Bidding Documents pages 280 and 281), utilizing system A7 as indicated for galvanized surfaces.

Q2. For the Area 60 Tank Farm containment basins, the first (base) coat of the original lining protection system appears to be adhered well to the concrete and may require abrasive methods for removal. The other (secondary) coating layers appear to be more feasible for removal. Does this first (base) coat need to be removed or can the new coating be placed on top of the original first (base) coat?

A2. Contractor shall perform Ultra High Pressure Washing and testing (adhesion and patch) to confirm if first (base) coat can remain. See revised Technical Specification Section 09880 of this Addendum for updated requirements.

Q3. For the Area 60 Tank Farm containment basins, the existing coating along the walls common to the pump room appear to be cracking away from the wall, including some concrete substrate material. Does the complete coating and spalling concrete in this region require removal and replacement?

A3. Yes, for the bottom 2-feet of identified basins connected to a common wall with the pump room. See revised Technical Specification Section 03930 of this Addendum for concrete repair requirements. See revised Technical Specification Section 09880 of this Addendum for updated coating requirements and list of basins with these requirements.

Based upon the second pre-bid site visit (April 27, 2015) and subsequent investigation, the existing corrosion protection lining systems within the Area 60, 76 and 80 chemical feed pump locations shall be removed and replaced in their entirety. Quantities identified in Addendum A, Bidder Question 3 (page 4 of Addendum A) are no longer valid and shall not be utilized. Approximate quantities for areas to be lined are included in revised Technical Specification Section 09880 of this Addendum.

Q4. For the Area 60 Tank Farm containment basins, do the cracks in the concrete walls require repair prior to coating?

- A4. Contractor shall repair cracks and deteriorated concrete per revised Technical Specification Section 03930 of this Addendum and Drawings 37240-66-D (Sheet 60-M-112A) and 37240-67-D (Sheet 60-M-113A). See revised Technical Specification Section 09880 of this Addendum for additional requirements.
- Q5. For containment basins on the project requiring coating improvements, what requirements are in place for cleaning the basin prior to coating, and for disposal of the materials and liquids cleaned from the basins?
- A5. Contractor shall clean all basins, remove debris and liquids, and dispose of debris and liquids per requirements included in the revised Technical Specification Section 09880 of this Addendum.

C. VOLUME 1

1. To Attachment D, Clean Water State Resolving Fund (CWSRF), Funding Agency Provisions, page 83, Item 11. Agency Specific Provisions Sub-item 11.1. All EPA Funded Contracts, Sub-item 11.1.5, Numeral 3, **DELETE** in its entirety and **SUBSTITUTE** with the following:
 3. The Contractor shall provide documentation that the local SBA/MBDA offices or web sites were notified of the contracting bid opportunity at least 30 Calendar 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.
2. To Attachment D, Clean Water State Resolving Fund (CWSRF), Funding Agency Provisions, page 83, Item 11. Agency Specific Provisions Sub-item 11.1. All EPA Funded Contracts, **ADD** the following:

11.1.6 For the duration of the construction contract, the Contractor is required to submit to the City DBE reports semi-annually by April 1 and October 1 of each fiscal year on the Utilization Report form (UR-334).
3. To Attachment D, Clean Water State Resolving Fund (CWSRF), Funding Agency Provisions, page 84, Item 12. DBE Potential Resources Centers, Sub-item 12.3, **DELETE** in its entirety and **SUBSTITUTE** with the following:

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 30 Calendar 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.
4. To Attachment D, Clean Water State Resolving Fund (CWSRF), Funding Agency Provisions, page 85, Item 12. DBE Potential Resources Centers, Sub-item 12.9

Notes, Numeral 2 and 3, **DELETE** in their entirety and **SUBSTITUTE** with the following:

2. The Contractor shall use SUB-Net to post subcontracting opportunities. The Contractor shall post Subcontractor opportunities at least 30 Calendar 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 30 Calendar 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. To Attachment D, Clean Water State Resolving Fund (CWSRF), Funding Agency Provisions, page 86, Item 14. Forms, Sub-item 14.1.1, Volume 1 Forms, **ADD** the following:
 9. Utilization Report form (UR-334)
5. To Attachment D, Clean Water State Resolving Fund (CWSRF), Funding Agency Provisions Forms, after page 96, **ADD** FORM UR-334 with page 12 of this Addendum.
6. To Attachment E, Supplementary Special Provisions, Technicals, pages 220 through 224, Section 03930, Concrete Crack Repair, **DELETE** in its entirety and **SUBSTITUTE** with pages 13 through 20 of this addendum.
7. To Attachment E, Supplementary Special Provisions, Technicals, page 230, Section 05120, Structural Steel, 2-2 Fabrication, Part 2-3.03 Painting, **ADD** the following:

Paint shall meet the requirements of the Protective Coatings section for galvanized metals.
8. To Attachment E, Supplementary Special Provisions, Technicals, page 240, Section 05550, Anchorage in Concrete and Masonry, Part 1 - General, Item 1-2 General, Cast-In-Place Anchor Bolts and Anchor Rods list and Adhesive, Expansion, and Undercut Anchors list, **DELETE** in their entirety and **SUBSTITUTE** with the following:

Cast-In-Place Anchor Bolts and Anchor Rods

All locations Stainless steel.

Adhesive, Expansion, and Undercut Anchors

All locations Stainless steel.

9. To Attachment E, Supplementary Special Provisions, Technicals, pages 254 through 265, Section 09880, Corrosion Protection Lining Systems, **DELETE** in its entirety and **SUBSTITUTE** with pages 21 through 37 of this Addendum.

10. To Attachment E, Supplementary Special Provisions, Technicals, page 280, Section 09940, Protective Coatings, Part 3-9 Metal Surfaces Coating Schedule, **ADD** the following:

Galvanized structural steel members A7

11. To Attachment E, Supplementary Special Provisions, Technicals, page 309, Section 11727, Liquid Chemical Feed Systems, Part 3 – Execution, Part 3-1.01 Equipment Bases, **ADD** the following:

Racks, including entire assembly and mounting hardware, shall be coated to match the coating system of the room per the Corrosion Protection Lining System section.

12. To Attachment E, Supplementary Special Provisions, Technicals, page 443, Section 15140, Pipe Supports, Part 2-1 Materials, **DELETE** in its entirety and **SUBSTITUTE** with the following:

2-1. MATERIALS. Unless otherwise indicated, all pipe supports shall comply with ANSI/MSS SP-58 and MSS SP-69. All pipe support materials shall be packaged as necessary to ensure delivery in satisfactory condition.

Unless otherwise specified or indicated on the Drawings, pipe supports shall be fabricated of manufacturer's standard materials and provided with manufacturer's standard finish.

Design loads for inserts, brackets, clamps, and other support items shall not exceed the manufacturer's recommended loads.

Pipe supports shall be manufactured for the sizes and types of pipe to which they are applied. Strap hangers will not be acceptable. Threaded rods shall have sufficient threading to permit the maximum adjustment available in the support item. Continuously threaded rod is not acceptable for hanger rods over 12 inches in length.

Unless accepted by Engineer, the use of supports which rely on stressed thermoplastic components to support the pipe will not be permitted.

Contact between dissimilar metals, including contact between stainless steel and carbon steel, shall be prevented. Portions of pipe supports which come into contact with other metals that are dissimilar shall be rubber or vinyl coated.

Pipe support types and application shall comply with Table 1.

All pipe support materials shall be Type 316 stainless steel except in the following locations: In areas within or above chemical containment areas for ferrous chloride, ferric chloride and sodium hypochlorite, pipe support material shall be FRP. All spring bolts and hardware shall be Type 316 stainless steel regardless of pipe support material.

13. To Attachment E, Supplementary Special Provisions, Technicals, page 470, Section 16050, Electrical, 1-6 Submittals, Part 1-6.01 Submittal Identification, **ADD** the following:

- f. Contractor shall submit a detailed conduit routing plan. Submittal shall include section views and details of proposed wall penetrations. Sections shall include core and conduit locations, size, quantity, spacing and reinforcement locations. Submittal shall be prepared for conduit penetrations through any existing walls, floors and roof structures.

14. To Attachment E, Supplementary Special Provisions, Technicals, page 474, Section 16050, Electrical, Part 2-6 Junction Boxes, Pull Boxes, and Wiring Gutters, **DELETE** in its entirety and **SUBSTITUTE** with the following:

Indoor boxes and gutters in corrosive areas and wet locations indicated on the Drawings and outdoor boxes and gutters shall be NEMA Type 4X, ABS and shall be rigidly supported by Type 316 stainless steel framing materials. Mounting hardware, which includes nuts, bolts, and anchors, shall be stainless steel. All damaged coatings shall be repaired according to the manufacturer's instructions.

15. To Attachment E, Supplementary Special Provisions, Technicals, page 479 through 482 , Section 16050, Electrical, 3-7 Conduit Installation, Part 3-7.01 Installation of Interior and Exposed Exterior Conduit, **DELETE** in its entirety and **SUBSTITUTE** with the following:

3-7.01. Installation of Interior and Exposed Exterior Conduit. This section covers the installation of conduit inside structures, above and below grade, and in exposed outdoor locations. In general, conduit inside structures shall be concealed. Large conduit and conduit stubs may be exposed unless otherwise specified or indicated on the Drawings. No conduit shall be exposed in water chambers unless so indicated on the Drawings.

Unless otherwise indicated on the Drawings, Contractor shall be responsible for routing the conduit to meet the following installation requirements:

- a. Conduit installed in all exposed indoor locations, except corrosive areas and wet areas indicated on the Drawings, and in floor slabs, walls, and ceilings of hazardous (classified) locations, shall be rigid steel. Exposed conduit shall be rigidly supported by hotdip galvanized hardware and framing materials, including nuts and bolts.
- b. Conduit installed in floor slabs and walls in non-hazardous locations shall be rigid Schedule 40 PVC.
- c. Conduit installed in corrosive chemical feed and storage areas, all exposed outdoor and wet indoor locations shall be PVC-coated rigid steel, rigidly supported by PVC-coated framing materials. Mounting hardware, which includes nuts, bolts, and anchors, shall be stainless steel. All damaged coatings shall be repaired according to the manufacturer's instructions.
- d. Final connections to dry type transformers, to motors without flexible cords, and to other equipment with rotating or moving parts shall be liquidtight flexible metal conduit with watertight connectors installed without sharp bends and in the minimum lengths required for the application, but not longer than 6 feet unless otherwise acceptable to Engineer.
- e. Terminations and connections of rigid steel and intermediate metal conduit shall be taper threaded. Conduits shall be reamed free of burrs and shall be terminated with conduit bushings.
- f. Exposed conduit shall be installed either parallel or perpendicular to structural members and surfaces.
- g. Two or more conduits in the same general routing shall be parallel, with symmetrical bends.
- h. Conduits shall be at least 6 inches from high temperature piping, ducts, and flues.
- i. Not Used.
- j. Rigid Schedule 40 PVC conduit shall have supports and provisions for expansion as required by NEC Article 352.
- k. Metallic conduit connections to sheet metal enclosures shall be securely fastened by locknuts inside and outside.

- l. Rigid Schedule 40 PVC conduit shall be secured to sheet metal device boxes using a male terminal adapter with a locknut inside or by using a box adapter inserted through the knockout and cemented into a coupling.
- m. Conduits in walls or slabs, which have reinforcement in both faces, shall be installed between the reinforcing steel. In slabs with only a single layer of reinforcing steel, conduits shall be placed under the reinforcement. Conduits larger than 1/3 of the slab thickness shall be concrete encased under the slab.
- n. Conduits that cross structural joints where structural movement is allowed shall be fitted with concrete tight and watertight expansion/deflection couplings, suitable for use with metallic conduits and rigid Schedule 40 PVC conduits. The couplings shall be Appleton Type DF, Crouse-Hinds Type XD, or O-Z Type DX.
- o. Conduit shall be clear of structural openings and indicated future openings including above each chemical tank within the chemical tank containment area.
- p. Conduits through roofs or metal walls shall be flashed and sealed watertight.
- q. Conduit installed through any openings cut into non-fire rated concrete or masonry structure elements shall be neatly grouted. Conduit penetrations of fire rated structure elements shall be sealed in a manner that maintains the fire rating as indicated on drawing R-2 under project data table Structural fire resistance requirements.
- r. Conduits shall be capped during construction to prevent entrance of dirt, trash, and water.
- s. Exposed conduit stubs for future use shall be terminated with galvanized pipe caps.
- t. Concealed conduit for future use shall be terminated in equipment or fitted with couplings plugged flush with structural surfaces.
- u. Where the Drawings indicate future duplication of equipment wired hereunder, concealed portions of conduits for future equipment shall be provided.
- v. Horizontal conduit shall be installed to allow at least 7 feet of headroom, except along structures, piping, and equipment or in other areas where headroom cannot be maintained.
- w. Conduit shall not be routed across the surface of a floor, roof, or walkway unless approved by Engineer.

- x. PVC-coated rigid steel conduit shall be threaded and installed as recommended by the conduit manufacturer's installation procedure using appropriate tools.
- y. All conduits that enter enclosures shall be terminated with acceptable fittings that will not affect the NEMA rating of the enclosure.
- z. Nonmetallic conduit, which turns out of concrete slabs or walls, shall be connected to a 90 degree elbow of PVC-coated rigid steel conduit before it emerges. Conduits shall have PVC-coated rigid steel coupling embedded a minimum of 3 inches when emerging from slabs or walls and the coupling shall extend 2 inches from the wall.
- ab. Power conductors to and from adjustable frequency drives shall be installed in steel conduit.
- ac. Electrical conduit penetration cores shall not exceed 2-inch in diameter. Adjacent cores shall be spaced a minimum of four (4) diameters of the largest core on center. Core locations shall be coordinated such that existing reinforcement is not cut or damaged. The outer edge of core shall be a minimum of 2-inches from reinforcement. All cores through a wall shall be in a single horizontal row. Amount of wall length removed by the cores shall not exceed 5 percent of the total wall length.
- ad. Contractor shall submit a detailed conduit routing plan. Submittal shall include section views and details of proposed wall penetrations. Sections shall include core and conduit locations, size, quantity, spacing and reinforcement locations. Submittal shall be prepared for new conduit penetrations through any existing walls, floors and roof structures. Submittal shall be reviewed and accepted by the Engineer prior to performing any coring in the structure. Contractor shall allow a minimum of 15 working days for Engineer's review of the proposed coring locations Contractor shall determine the location of existing reinforcement prior to installation of any cores. Identification shall be per non-destructive methods, which may include X-ray or other methods approved by the Engineer.

D. PLANS

1. To Drawing number 37240-01-D, (T-1), **DELETE** in its entirety and **REPLACE** with Page 38 of this Addendum.
2. To Drawing number 37240-5-D, (R-2), **DELETE** in its entirety and **REPLACE** with Page 39 of this Addendum.
3. To Drawing number 37240-6-D, (R-33), **DELETE** in its entirety and **REPLACE** with Page 40 of this Addendum.

4. To Drawing number 37240-39-D, (60-D-113), **DELETE** in its entirety and **REPLACE** with Page 41 of this Addendum.
5. To Drawing number 37240-66-D, (60-M-112A), **DELETE** in its entirety and **REPLACE** with Page 42 of this Addendum.
6. To Drawing number 37240-67-D, (60-M-113A), **DELETE** in its entirety and **REPLACE** with Page 43 of this Addendum.
7. To Drawing number 37240-79-D, (60-M-216), **DELETE** in its entirety and **REPLACE** with Page 44 of this Addendum.
8. To Drawing number 37240-93-D, (76-M-409A), **DELETE** in its entirety and **REPLACE** with Page 45 of this Addendum.
9. To Drawing number 37240-111-D, (80-M-116A), **DELETE** in its entirety and **REPLACE** with Page 46 of this Addendum.

James Nagelvoort, Director
Public Works Department

Dated: *May 8, 2015*
San Diego, California

JN/RWB/Lad

Section 03930

CONCRETE CRACK REPAIR

PART 1 - GENERAL

1-1. SCOPE. This section covers the repair of existing concrete surfaces, cracks and joints required to complete the work.

1-1.01. General Crack Repair. General crack repair shall include the following:

- a. Sealing of all cracks and crack networks that are wider than 10 mils (0.01 inch) as measured at the exposed surface.
- b. All necessary repairs to structures that have failed a leakage test, including sealing of construction joints.

Contractor shall anticipate 500 linear feet (approximate) of general crack repair in the Contract Price.

1-1.02. General Surface Repair. General surface repair shall include the following:

- a. Repair, rehabilitate or reconstruct spalled, deteriorated, or structurally damaged concrete surfaces.
- b. Depth of repairs shall be adequate to restore concrete members to original dimensions and surface profiles.

Contractor shall anticipate 500 square feet (approximate) of general concrete surface repair in the Contract Price.. General concrete surface repair work is expected to be necessary on the Project due to existing concrete surface deterioration, cracks and joints that have occurred over time in the containment basins.

1-1.03. Engineer-Directed Crack Repair. Engineer-directed crack repair work shall only be performed when instructed by Engineer. The work shall include, but is not limited to, the following:

- a. Sealing of construction joints that are not otherwise required to be sealed as the result of a failure of a leakage test.
- b. Sealing of cracks and crack networks with a width of 10 mils (0.01 inch) or less as measured at the exposed surface.

Contractor shall anticipate 150 linear feet (approximate) of Engineer-directed crack repair in the Contract Price.

1-2. SUBMITTALS. Specifications and data covering physical properties, mixtures, application procedures, and curing procedures of the materials proposed shall be submitted in accordance with the Greenbook and Whitebook Submittals section. Submittals shall include the approvals from the material manufacturer.

1-3. QUALITY ASSURANCE.

1-3.01. Manufacturer's Field Services. The material manufacturer shall provide engineering field services to review the Project and the material application prior to any preparation; to approve the applicator, the material used, and the procedure to be used; to observe surface preparation; to approve surface preparation; and to observe application and curing procedures. The field representative of the material manufacturer shall submit, in writing through Contractor, approvals of proposed material, application procedures, applicator, and surface preparation. The field representative shall be an employee of the material manufacturer.

1-3.02. Applicator. The applicator and repair contractor shall be experienced and proficient specifically to the repair types needed. Submit through Contractor a satisfactory experience record including references from previous application of the specified materials to structures of similar design and complexity.

1-3.03. Pre-Construction Meeting. At least 30 days prior to concrete crack, Contractor shall conduct a meeting to review the detailed requirements for rehabilitation work. Site conditions, surface preparation, proposed equipment, procedures, material mixing, placing procedures, and curing methods shall be discussed and approved by Engineer and by the manufacturer's field representative. Contractor shall require the attendance of all involved parties, including but not limited to Contractor's superintendent, repair contractor, manufacturer's field representative and proposed equipment supplier representative. Minutes of the meeting shall be recorded, typed and printed by Contractor and distributed to all parties within 5 days after the meeting.

1-3.04. Quality Assurance Certification. Material manufacturers shall be ISO 9001/9002 registered or shall provide proof of documented quality assurance. The documented quality assurance system shall be obtained through an independent auditing registrar.

1-4. DELIVERY, STORAGE, AND HANDLING. Shipping shall be in accordance with the Product Delivery Requirements section. Handling and storage shall be in accordance with the Product Storage and Handling Requirements section.

PART 2 - PRODUCTS

2-1. PERFORMANCE AND DESIGN REQUIREMENTS. Unless otherwise specified or authorized, repairs shall conform to the requirements specified herein. Types of repairs not specified herein shall be as specified in other sections, as indicated on the Drawings, or, in the absence of any definite requirement, as recommended by the manufacturer's representative and subject to acceptance by Engineer. The following types of repairs shall be performed as required.

2-1.01. Pressure-Injected Epoxy Resin. Pressure-injected epoxy resin shall be used to seal cracks, construction joints, and other repairs in concrete and shotcrete structures as required or as directed by Engineer.

2-1.02. Pressure-Injected Foam Resin. Pressure-injected foam resin shall be used to seal joints and cracks in concrete and shotcrete structures that will have movement as required or as directed by Engineer.

2-1.03. Crack Sealant. Crack sealant shall be used to seal cracks in structures prior to pressure injection of resin.

2-1.04. Concrete Repairs and Overlays. Polymer-modified, cementitious product shall be used to repair and overlay damaged and deteriorating concrete surfaces prior to coating applications.

2-2. ACCEPTABLE PRODUCTS. Repair products/materials shall be manufactured by the companies specified herein. Equivalent products of other manufacturers regularly producing high quality concrete crack repair products/materials, providing engineering field services, and meeting the specified quality assurance requirements may be furnished subject to review and acceptance by Engineer.

Concrete repair and restoration products/materials shall be manufactured by the Euclid Chemical Company, BASF Corporation, Sika Corporation, or equal as specified herein.

2-3. MATERIALS. All materials shall be as specified or as recommended by the manufacturer for temperature and moisture conditions encountered.

Products shall not exceed VOC limits established by the federal, state, or local regulatory agency having jurisdiction over the project site.

2-3.01. Crack Repairs.

Pressure-Injected Epoxy Resin

ASTM C881, Type I or Type IV, moisture tolerant or moisture insensitive.

Pressure-Injected Foam Resin

Hydrophilic polyurethane foam; Prime Resins "Prime-Flex 900 XLV", DeNeef "HYDRO ACTIVE Sealfoam", or Avanti "AV-333

	Injectaflex".
Foam Resin Accelerator	As recommended by foam resin manufacturer.
Crack Sealant	As recommended by the manufacturer of the pressure-injected epoxy resin product.
Water	Clean and free from deleterious substances.

2-3.02. Horizontal Repairs and Overlays.

Overlay thickness less than one inch. One-component or two-component, polymer-modified, cementitious product. Material shall have the following properties:

1. Minimum 7,000 psi compressive strength at 28 days per ASTM C109 using 2 inch (50 mm) cubes.
2. Minimum 1,200 psi flexural strength at 28 days per ASTM C348.
3. Minimum 2,400 psi bond strength at 28 days per ASTM C882 modified.
4. Bonding agent shall be a repair mortar scrub coat utilizing mixed product per manufacturer's printed installation instructions.

MasterEmaco T 302	BASF
MasterEmaco T 310CI	BASF
Dural Top Flowable Mortar	Euclid
Concrete Top Supreme	Euclid
SikaTop 122 Plus	Sika

2-3.03. Vertical or Overhead (Non-sag) Repairs.

One-component or two-component, polymer modified, cementitious mortar containing a migratory corrosion inhibiting admixture and suitable for interior or exterior use. Material shall have the following properties:

1. Minimum compressive strength per ASTM C109 using 2 inch (50 mm) cubes.
 - a. 2,500 psi at 1 day
 - b. 6,000 psi at 7 days
 - c. 7,000 psi at 28 days
2. Minimum flexural strength per ASTM C348.
 - a. 650 psi at 7 days
 - b. 1,200 psi at 28 days
3. Minimum 2,500 psi at 28 days shear bond strength per ASTM C992.
4. Freeze/Thaw resistance of 320 cycles, 99% RDF, per ASTM C666.
5. Volumetric resistivity of 7,980 ohm/cm.
6. Bonding agent shall be a repair mortar scrub coat utilizing mixed product per manufacturer's printed installation instructions. The bonding agent shall be used for all trowel applied mortars.

MasterEmaco S 440CI
Verticoat Supreme
Speed Crete PM
SikaTop 123 Plus

BASF
Euclid
Euclid
Sika

PART 3 - EXECUTION

3-1. INSPECTION. Prior to the placement of the repair materials, concrete surfaces and cracks to be repaired shall be inspected by the Engineer and manufacturer's field representative to assure that preparation and conditions are correct for the type of repair and the product/material being used as specified herein.

3-2. PREPARATION. All prepared surfaces shall be free of objectionable substances and shall conform to the requirements of the material manufacturer. Concrete and shotcrete to be repaired shall be cleaned by methods acceptable to the material manufacturer so that the cracks and surfaces are free of dirt, oil, grease, laitance, and other foreign matter. All loose and deteriorated existing concrete and shotcrete shall be removed down to sound materials. All concrete and shotcrete surfaces shall be checked for delamination to ensure that all surfaces are sound. All edges shall be square cut to avoid feather edges.

Remove all loose and unsound concrete per International Concrete Repair Institute (ICRI) Guideline 310.1R "Guide for Surface Preparation." Unsound concrete surfaces shall have perimeter boundaries saw cut to minimum depth of one-half inch, or less if such depth will cause saw to come in contact with embedded reinforcing steel. Saw cuts shall be made perpendicular to the concrete surface and all concrete removal boundaries shall be straight and aligned parallel to opposite boundary edges resulting in repair areas that are rectangular in shape.

Contractor shall provide a surface profile which is suitable for bonding, as defined in repair manufacturer's printed installation instructions. In the absence of other instructions, the surface shall be roughened to 1/4 inch amplitude. If delamination, cracking, or unsound material exists beyond minimum removal depth, then removal shall continue until all unsound, delaminated, or cracked concrete has been removed from the repair area.

Surfaces shall be prepared mechanically using a scabbler, bushhammer, chipping hammer, shotblast, scarifier or hydrodemolition equipment which will give the specified surface profile. Any other preparation recommended by the material manufacturer shall be brought to Engineer's attention and may be incorporated into the work if acceptable to Engineer.

Concrete and shotcrete surfaces in the area of a crack to be repaired shall be cleaned by wire brushing, blasting, or other acceptable methods.

Wall surfaces shall be sandblasted clean to expose crack networks and construction joints. If there is active water seepage in the repair area, the seepage shall be stopped as recommended by the injection material manufacturer and as acceptable to Engineer. Injection ports shall be installed, when recommended by the injection material manufacturer.

3-2.01. Injected Epoxy Resin. Preparation for injected epoxy resin shall include sealing the surface at the crack on both sides, when possible, with crack sealant as recommended by the material manufacturer and as acceptable to Engineer for the pressure injection work. Injection ports for epoxy resin shall penetrate through the crack sealant into the cracks at spacings recommended by the material manufacturer.

3-2.02. Injected Foam Resin. Preparation for injected foam resin shall include drilling offset injection holes at an angle that will intersect the crack, joint, or crack network at approximately one-half the thickness of the concrete or shotcrete up to a thickness of 36 inches. Spacing of injection ports shall be determined as recommended by the injection material manufacturer and as acceptable to Engineer. When the injection material manufacturer certifies, in writing, that spacing of injection ports and installation procedures are acceptable, the injection ports may be installed directly into the crack, subject to review by Engineer.

3-3. APPLICATION. Concrete and shotcrete repair work shall be performed in accordance with the following requirements.

3-3.01. Bonding and Priming. Bonding agent shall be applied per manufacturer's recommendations. The manufacturer's coverage rate shall be followed. For rough surfaces, scrub bonding agent into the surface with a stiff broom.

Apply all prepackaged bonding agent materials within recommended ambient and substrate temperatures published in the manufacturer's printed installation instructions. Do not apply materials over frozen or liquid filled surfaces.

Upon completion of all concrete and reinforcing steel demolition, surface preparation, and cleaning operations, apply specified bonding agent to substrate. Provide complete and thorough coverage of surface assuring that bonding agent has been fully worked into profile of surface.

In areas where bonding agents classified as a mortar scrub coat are to be applied directly to concrete surface, such surfaces shall be saturated with water one hour prior to placement of the scrub coat to provide a saturated substrate. Just prior to application of the scrub coat, water shall be removed by compressed air blasting. Compressed air shall be maintained free of oil and contaminants by filtration as needed.

In areas where bonding agents classified as an extended open time epoxy emulsion cement modified bonding agent are to be applied and all exposed reinforcing steel and other metal embeddings, mix bonding agent and apply two uniform coats at

manufacturer's published recommended coverage rates to properly prepared surfaces. Allow adequate time between coats per manufacturer's recommendations.

Special attention shall be given to timing of placement of bonding agents, so that the repair mortar is able to be placed within the allowable open time of the bonding agent or while any mortar scrub coats are wet and have not yet stiffened.

3-3.02. Crack Sealant. Crack sealant shall be trowel-applied to a minimum dried thickness of 1/8 inch. The concrete surface where the sealant is applied shall be smooth, uniform, and free from irregularities. Crack sealant shall be removed after the injection of resin is completed whenever the sealant will be visible after completion of the work.

3-3.03. Pressure-Injected Resin. The injected areas shall be prepared as specified and as recommended by the manufacturer. Pressure-injected resin shall be suitable for penetration of joints, cracks, and crack networks 2 mils (0.002 inch) wide and larger.

After the joints and cracks are prepared and before the injection of the resin, the joints shall be flushed with water. The water flush shall be terminated when the turbidity of the expelled water is equal to that of the flush water.

The pumping equipment used for the pressure injection of resin shall have pressure metering. Written procedures for use and quality control of the injection equipment shall be furnished to Engineer for review and acceptance. The pump shall be electric. The material and process used for the pressure injection of the resin shall have been in use a minimum of 5 years.

The joints and crack networks shall have a minimum of 90 percent penetration of resin into the joint or crack network. Core samples may be taken at Engineer's discretion.

3-3.03.01. Epoxy Resin. Epoxy resin shall be injected into the structure in accordance with the material manufacturer's recommendations and as acceptable to Engineer. Epoxy resin shall be injected until the resin appears at the next port.

3-3.03.02. Foam Resin. Foam resin shall be premixed and injected into the structure in accordance with the material manufacturer's recommendations and as acceptable to Engineer. Foam resin shall be injected into the structure until the resin appears at the next injection port.

3-3.04. Cold Weather. When ambient temperatures below 40°F are expected during the curing period, the repair materials shall be maintained at a temperature of at least 50°F for 14 days or 75°F for 7 days after placement. Sudden cooling of the repair materials shall not be permitted.

3-4. CURING. Immediately following placement and finishing procedures, cure cementitious repair mortars for a minimum of seven days or as recommended per

material manufacturer. Curing procedures shall be in accordance with ACI 308.1 and the manufacturer's printed installation instructions. The more stringent requirements shall control.

During cold weather conditions, as defined by ACI 306.1, cold weather concreting procedures shall be followed including thermal protection of repair materials and removal of wet curing 24 hours prior to exposure to freezing temperatures. Unless specified otherwise, one or more of the following methods shall be used:

3-4.01. Water Curing. Keep concrete surfaces continuously wet with water during the curing period. The method used shall limit water runoff and any runoff shall be directed and controlled. The difference in temperature between the water used for curing and the concrete surface shall not exceed 20 degrees F except when deemed a significant safety hazard and acceptable to Engineer.

3-4.02. Wet Coverings Curing. Cover the surfaces with moisture retaining curing blankets, burlap, cotton mats, or other suitable moisture retaining materials. The coverings shall not stain or otherwise discolor the repair material or the surrounding surfaces, and shall keep the repair products fully saturated during the curing period. Lap all coverings at least 8 inches at joints.

3-4.03. Membrane Curing. Membrane curing compounds shall not be used as a method for curing repair materials except when water curing or wet coverings curing are not acceptable to the repair material manufacturer and the manufacturer's printed installation instructions requires membrane curing compounds to be used.

3-5. SEALING. Provide a penetrating sealer over the concrete repair product when recommended by the repair product manufacturer, or when no other sealer is specified on the drawings or other specifications. The penetrating sealer shall be applied in accordance with the manufacturer's instructions.

Surfaces of cracks and joints may need to be sealed with crack sealant.

3-6. PROTECTION. Post-placement curing and protection shall be as specified herein and in accordance with the manufacturer's recommendations.

3-7. CLEANING. Work areas shall be cleaned each day and shall be in accordance with the Green and Whitebook Work Site Maintenance section. Upon completion of the final cleanup, Contractor shall restore all areas affected by the grouting procedures to their original condition, leaving no trace of material piles or other wasted materials.

End of Section

Section 09880

CORROSION PROTECTION LINING SYSTEMS

PART 1 - GENERAL

1-1. SCOPE. This section covers furnishing and installation of corrosion protection systems to be applied to floors and walls at the chemical storage facilities (Area 60 chemical storage tank farm), as well as the chemical containment basins in Areas 60, 76 and 80 pump rooms as specified herein and as indicated on the Drawings. This section covers containment basin cleaning, concrete surface preparation, furnishing and application of a corrosion protection system suitable for each set of specified service conditions, the engineering field services to be provided by the material manufacturer, and any appurtenances that are required to provide a completed corrosion protection system.

The Contractor shall install corrosion protection lining systems for all containment floors and walls indicated in this Section and on the Drawings, including removal of the existing coatings, surface preparation, concrete repair, grouting and caulking, and lining system installation. New lining systems shall be applied as follows:

- Area 60 Chemical Tank Farm – containment basin floors and walls up to the top of the containment walls, including top of tank concrete pedestal adjacent to tanks and tank supports
- Area 60 Pump Rooms (including polymer mixing pump room) - containment basin floors and walls up to the top of the floor grating, including pump concrete pedestals
- Area 76 Ferric Chloride Room - containment basin floors and walls up to the top of the floor grating
- Area 80 Ferrous Chloride Room - containment basin floors and walls up to 30-inch above the finish grating elevation

Approximate quantities of surface area to be coated have been calculated based on containment basin geometry. Final quantities utilized in preparation of the bid shall be the responsibility of the Contractor.

Location	Chemical	Surface Area (SF) to be Lined (Approximate)
Area 60 Tank Farm: Empty Basin	Empty Basin	1000
Area 60 Tank Farm: T-41 and T-42 Containment Basin	Sodium Hydroxide	1000
Area 60 Tank Farm: T-51 and T-52 Containment Basin	Sodium Hypochlorite	1200
Area 60 Tank Farm: T-61 and T-62 Containment Basin	Sulfuric Acid	1000
Area 60 Tank Farm: T-71 and T-72 Containment Basins	Ferric Chloride	2000
Area 60 Tank Farm: T-81 and T-82 Containment Basin	Ferrous Chloride	1200
Area 60 Tank Farm: T-1, 2, 11, 12, 13, 14 Containment Basins	Polymer (Storage)	5500
Area 60 Tank Farm: T-21 thru T-24 Containment Basin	Polymer (Mixing)	1600
Area 60 Pump Room: Sodium Hydroxide Pumps	Sodium Hydroxide	425
Area 60 Pump Room: Sodium Hypochlorite Pumps	Sodium Hypochlorite	425
Area 60 Pump Room: Sulfuric Acid Pumps	Sulfuric Acid	425
Area 60 Pump Room: Ferric and Ferrous Chloride Pumps	Ferric Chloride and Ferrous Chloride	425
Area 60 Pump Room: Polymer Recirculation / Transfer Pumps	Polymer	1500
Area 60 Pump Room: Polymer Mixing Pumps	Polymer	700
Area 76 Ferric Chloride Day Tanks Feed Room	Ferric Chloride	1000

Area 80 Ferrous Chloride Day Tanks Feed Room	Ferrous Chloride	900
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1-2. QUALITY ASSURANCE.

1-2.01. Manufacturer's Field Services. The applicator of the protection system shall contact the corrosion protection system material manufacturer during the bidding phase of the project and shall include in the cost of this work the cost of the manufacturers engineering field services as specified.

The field services provided by the material manufacturer shall include review of the project before surface preparation; approving the applicator, the materials, and the procedure to be used; observation and approval of the surface preparation, including testing of any existing basecoat remaining on the surface; and observing the application. Where specified herein, the manufacturer shall also provide adhesion testing to determine compliance with the specified minimum pull-off adhesion strength, for both the existing basecoat (if any remaining) and the new lining systems. The field representative of the protection system material manufacturer shall submit, through Contractor, written approvals of the proposed protection system materials, application procedures, applicator, and surface preparation. The field representative shall be an employee of the material manufacturer.

Contractor shall notify the material manufacturer and Engineer at least 20 days prior to anticipated date of removal of the existing and placement of the new corrosion protection lining systems.

1-2.02. Applicator. The protection system applicator shall submit a satisfactory experience record including references for previous application of the specified protection system to concrete structures of similar design and complexity. The material manufacturer shall approve the applicator in writing.

1-3. SUBMITTALS. Complete specifications and data on the protection systems, application instructions and procedures, and material manufacturer's approvals of the protection systems furnished under this section shall be submitted in accordance with the Greenbook and Whitebook Submittals section. The lining manufacturer shall submit acceptable lining termination details for review. The protection system manufacturer shall provide certification for each component of the protection system that will provide corrosion resistance for the specified service conditions. The material manufacturer after application of the protection systems shall certify that the protection systems are free of pinholes and holidays.

1-4. DELIVERY, STORAGE, AND HANDLING. The material shall be delivered to the jobsite in original unopened containers with labels intact. Protection

system components shall be stored indoors in an appropriate location and environment in accordance with the manufacturer's recommendations and shall be protected against freezing.

Shipping shall be in accordance with the Product Delivery Requirements section. Handling and storage shall be in accordance with the Product Storage and Handling Requirements section.

1-5. WARRANTY. Material manufacturer shall warrant the chemical resistance of each corrosion protection system for a period of three years from the date of Substantial Completion when exposed to the customer's normal operating conditions as stated in the specification. This warranty shall not cover wear and tear such as abrasion resistance or mechanical abuse.

Applicator shall warrant the lining installation for three years.

PART 2 - PRODUCTS

2-1. PERFORMANCE AND DESIGN REQUIREMENTS.

2-1.01. General Service Conditions. The linings shall provide splash and spill protection for 72 hours from the chemicals as specified herein.

Surfaces to be coated are concrete, and include an existing unknown coating system originally applied to the concrete during initial plant construction. The existing coating system includes a basecoat (first coat) and a minimum of at least one secondary coat that is failing.

2-2. MATERIALS. Materials shall be suitable for the specified service conditions. Products composing the corrosion protection system shall be chemically resistant to the chemicals, concentrations, temperatures, exposure times, and other relevant service conditions. In many cases, repair materials, primers, flexible basecoats, and other ancillary products that will be protected by a corrosion resistant and/or wear resistant layer of the protection system and may not be required to meet these criteria provided the overall protection system complies with the performance criteria. Each product of the protection system that complies with the performance requirements shall be certified as such by the protection system manufacturer. When recommended by the lining manufacturer, a vapor barrier shall be included as part of the corrosion protection system at no additional cost.

Each corrosion protection system specified is manufactured by Dudick, Inc. Acceptable alternative manufacturers that may have a corrosion protection system that will satisfy the specified service conditions and may be furnished subject to review and acceptance by Engineer, are Carboline,

Ceillcote/International Co., KCC Corrosion Control Co. Ltd, , Sherwin-Williams Control Tech Corrosion Protection Systems and Tnemec Company without exception. Other manufacturers and their corrosion protection systems will not be acceptable.

2-2.01. Epoxy Protection Systems.

2-2.01.01. Service Conditions for Epoxy Protection Systems.

Chemicals to be contained at the maximum chemical temperature of 120°F that are not corrosive to concrete, do not stain concrete, and are not hazardous to the environment:

Polymer.

Epoxy protection systems will be exposed to sunlight, UV, and outdoor atmosphere.

2-2.01.02. System Requirements for Epoxy Protection Systems.

Type of lining system.	Lining , mat reinforced with flexible basecoat.
Location(s) where mat reinforce with flexible basecoat lining system is required:	Area 60 Chemical Storage Tank Farm Containment Basins for: Polymer Bulk Storage (T-1, T-2, T-11, T-12, T13, and T-14 basins), Polymer Mixing (T-21,22,23,24 basin)(7 total basins); Area 60 Polymer Recycle/Transfer Pump Area Containment Basins; Area 60 Polymer Mixing Pump Containment Basins

2-2.01.03. Epoxy Coating Protection System. Not used.

2-2.01.04. Epoxy Flexible Lining Protection System. When an epoxy lining system with a flexible basecoat is required, the corrosion protection system shall be a two-component, 100 percent solids, solvent-free, epoxy resin, silica filled, fiberglass mat reinforced flexible basecoat, high-build protective and waterproofing lining, Dudick "Protecto-Flex 310". All resins in this system shall be 100 percent solids with at least two components. The concrete surface primer shall be a conductive, amine cured epoxy resin, Dudick "Primer 67C". The flexible basecoat shall be certified by the material manufacturer as capable of not less than 50 mils of differential movement without damaging the corrosion protection system. The basecoat shall be a flexible epoxy resin with silica fillers

with a chopped strand mat reinforcement and saturant. The finish coats shall be amine cured epoxy resin.

2-2.02. Vinyl Ester Protection Systems. Not used.

2-2.03. Vinyl Ester With Graphite Filler Protection Systems.

2-2.03.01. Service Conditions for Vinyl Ester With Graphite Filler Protection Systems.

Chemicals to be contained at the maximum chemical temperature of 120°F , unless otherwise indicated, that are corrosive to concrete:

Ferric chloride; 45% conc.

Ferrous chloride; up to 35% conc.

Sodium hydroxide; 150°F .

Sodium hypochlorite; up to 15% conc.

Vinyl ester with graphite filler protection systems will be exposed to sunlight, UV, and outdoor atmosphere.

2-2.03.02. System requirements for Vinyl Ester With Graphite Filler Protection Systems.

Type of lining system.

Lining, mat reinforced with flexible basecoat.

Location(s) where a mat reinforced with flexible basecoat lining corrosion protection system is required:

Area 60 Chemical Storage Tank Farm Containment Basins for: Ferric Chloride (T-71 and T-72 basins), Ferrous Chloride (T-81/T-82 basin), Sodium Hydroxide (T-41/T-42 basin), Sodium Hypochlorite (T-51/T-52 basin); Area 60 Pump Room Containment Basins for chemicals noted above.

Area 76 Ferric Chloride day tank feed room.

Area 80 Ferrous Chloride day tank feed room.

2-2.03.03. Vinyl Ester With Graphite Filler Coating System. Not used.

2-2.03.04. Vinyl Ester With Graphite Filler Rigid Lining System. Not used.

2-2.03.05. Vinyl Ester With Graphite Filler Flexible Lining System. The corrosion protection system shall be a two component, 100 percent solids, solvent-free, vinyl ester resin, graphite filled, mat reinforced flexible basecoat, high-build protective and waterproofing lining, Dudick "Protecto-Flex 805". Concrete surface primer shall be a epoxy resin containing conductive fillers, 100 percent solids, Dudick "Primer 67C". The flexible basecoat shall be certified by the material manufacturer as capable of not less than 50 mils of differential movement without damaging the corrosion protection system. Flexible basecoat with reinforcement shall be epoxy resin with silica fillers. Reinforcement shall be chopped strand mat. Saturant for reinforcement shall be epoxy resin. Finish coats shall be a two component, 100 percent solids, solvent-free, graphite filled vinyl ester resin.

2-2.04. Novolac Vinyl Ester Protection Systems. Not used.

2-2.05. Novolac Epoxy Protection Systems.

2-2.05.01. Service Conditions for Novolac Epoxy Protection Systems.

Chemicals to be contained at the maximum chemical temperature as indicate that are corrosive to concrete:

Sulfuric acid; up to 98% conc. at 150°F .

Novolac epoxy protection systems will be exposed to sunlight, UV, and outdoor atmosphere.

2-2.05.02. System requirements for Novolac Epoxy Protection Systems.

Type of lining system.	Lining, mat reinforced with flexible basecoat.
Location(s) where a mat reinforced with flexible basecoat lining corrosion protection system is required:	Area 60 Chemical Storage Tank Farm Containment Basins for: Sulfuric Acid (T-61/T-62 basin); Area 60 Pump Room Containment Basin for sulfuric acid pumps

2-2.05.03. Novolac Epoxy Coating Protection System. Not used.

2-2.05.04. Novolac Epoxy Rigid Lining Protection System. Not used.

2-2.05.05. Novolac Epoxy Flexible Lining Protection Systems. The novolac epoxy corrosion protection system shall be a two component, 100 percent solids, solvent-free, novolac epoxy resin, silica filled, high-build protective and waterproofing coating, Dudick "Protecto-Flex 100XT". Concrete surface primer shall be a epoxy resin containing conductive fillers, 100 percent solids content, Dudick "Primer 67C". The flexible basecoat shall be certified by the material manufacturer as capable of not less than 50 mils of differential movement without damaging the corrosion protection system. Flexible basecoat with reinforcement shall be an epoxy resin with silica fillers and chopped strand fiberglass mat. Saturant for reinforcement shall be epoxy resin. Finish coats shall be a two component, 100 percent solids, novolac epoxy resin.

2-2.06. Epoxy Filler Compound. Epoxy filler compound for concrete surfaces shall be a two-component, 100 percent solids epoxy filler or as recommended by the corrosion protection system material manufacturer.

2-2.07. Corrosion Resistant Caulking/Sealant. Chemical resistant caulking/sealant shall be suitable for the specified service conditions and shall be as recommended, in writing, by the protection system material manufacturer.

2-2.08 Reinforced Epoxy Resin Topping Systems. Not used.

2-2.09 Reinforced Vinyl Ester Resin Topping Systems. Not used.

2-2.10 Reinforced Vinyl Ester with Graphite Resin Topping Systems. Not used.

2-2.11 Reinforced Novolac Vinyl Ester Resin Topping Systems. Not used.

2-2.12 Reinforced Novolac Epoxy Resin Topping Systems. Not used.

PART 3 - EXECUTION

3-1. GENERAL. All details, methods, and procedures of mixing, surface preparation, bonding, application, finishing, curing, and protection of the protection system shall be in strict accordance with the recommendations of the material manufacturer. The applicator shall comply with the recommendations of the material manufacturer's engineering field representative.

3-1.01. Protection System Sequencing Constraints. The locations for the corrosion protection lining systems require other improvement Work, including other Work to be performed prior to installation of the protection systems. Contractor shall prepare a coating schedule for installation of all coatings and linings meeting the requirements of this Section and conditions of the

Construction Sequencing section prior to any Work. Installation of coatings and linings may require phasing in order to maintain continuous operation of the chemical feed systems and storage tanks, as well to account for other Work performed in the basin and installation timing of other improvements. Coating and lining shall only commence upon approval of the coating schedule. Deviations to the schedule shall be submitted to the Engineer a minimum of 48 hours prior to the deviation for review and approval.

Installation of the corrosion protection lining systems for all locations shall occur after the following Work has been performed, unless approved otherwise by the Engineer:

- Demolition and equipment / material removals
- Cleaning of containment basins
- Removal of existing and installation of new electrical improvements, including conduits and electric boxes / cabinets
- Removal of existing and installation of new chemical feed piping and valve supports
- Removal of existing and installation of new chemical feed pumps and appurtenances

The Contractor Construction Sequence Plans (CCSP) required per the Construction Sequencing section shall indicate the Work to be completed prior to installation of the protection systems. Other parts of the Work to be installed within or adjacent to the containment basins, including but not limited to, new catwalks and supporting members, shall be coordinated between the Applicator and Contractor, such that damage to the new protection systems does not occur from other new Work.

3-2. SURFACE PREPARATION. All surfaces shall be free of objectionable substances and shall meet the manufacturer's recommendations for surface preparation. If the lining material manufacturer recommends any other surface preparation, it shall be brought to Engineer's attention and may be incorporated into the work if acceptable to Engineer.

All surfaces shall be dry when coated or lined, and shall be free from dirt, dust, sand, mud, oil, grease, rust, mill scale, and other objectionable substances. Oil and grease shall be completely removed as recommended by the material manufacturer before mechanical cleaning is started.

Containment Basin Cleaning. The existing chemical containment basins may include existing chemical residue, debris and other materials on the floors and walls. Removal of debris, removal of existing chemical residue, and high pressure wash down of each chemical containment basin in all improvement locations shall be performed prior to any corrosion protection lining system Work. Cleaning of containment basins shall be coordinated with the Owner and Plant operations. Contractor shall dispose of all solids and liquids generated during the

cleaning process per Federal, State, Regional and Local regulations. Solids shall be decanted and screened from the liquid prior to discharge. Solids shall be properly disposed of at an acceptable landfill or other disposal facility. Discharge of liquids shall be coordinated with the Plant operations such that the liquid can be discharged to the local sewer system if within allowable chemical properties (pH and others required by the plant). Contractor shall test liquid to provide Plant operations with information and characterization of the liquid to be discharged into the sewer system, and shall receive approval from Plant operations prior to any discharge into the sewer system.

Surface Preparation Schedule. The surface preparation anticipated for each of the areas to be coated is as follows:

Location	Surface Preparation	Additional Notes
Area 60 Tank Farm, All containment basins, excluding bottom 2-feet of common wall to interior pump rooms (empty basin and Tanks T-52, T-82, T-72)	Basin Cleaning per Section 3-2 plus Section 3-2.03 "Existing Coated Surface" (including Ultra High Pressure Wash and testing to confirm base coat is a competent surface.)	For areas of any concrete damage or spalling, and concrete cracks in walls and floors, repair prior to coating installation per Concrete Crack Repair section. For areas of exposed concrete, prepare per 3-2.01 "Concrete Surfaces"
Area 60 Tank Farm, bottom 2-feet of east wall (common to pump room), containment basins for empty basin and Tanks T-52, T-82, T-72	Basin Cleaning per Section 3-2 plus Section 3-2.03 "Existing Coated Surface" (including Ultra High Pressure Wash and testing to confirm base coat is a competent surface) plus repair concrete prior to coating per Concrete Crack Repair section.	For areas of any concrete damage or spalling, and concrete cracks in walls and floors, repair prior to coating installation per Concrete Crack Repair section.
Area 60 Pump Room, all containment basins	Basin Cleaning per Section 3-2 plus Section 3-2.03 "Existing Coated Surface" (including Ultra High	For areas of any concrete damage or spalling, and concrete cracks in walls and floors, repair prior to coating installation per Concrete Crack Repair

	Pressure Wash and testing to confirm base coat is a competent surface.)	section. For areas of exposed concrete, prepare per 3-2.01 "Concrete Surfaces"
Area 60 Polymer Pump Room, new concrete pad extension for new polymer pump	Basin Cleaning per Section 3-2 plus 3-2.01 "Concrete Surfaces"	
Area 76 Ferric Chloride Room containment basin	Basin Cleaning per Section 3-2 plus Section 3-2.03 "Existing Coated Surface" (including Ultra High Pressure Wash and testing to confirm base coat is a competent surface.)	For areas of any concrete damage or spalling, and concrete cracks in walls and floors, repair prior to coating installation per Concrete Crack Repair section. For areas of exposed concrete, prepare per 3-2.01 "Concrete Surfaces"
Area 80 Ferrous Chloride Room containment basin and walls (including 30-inch above finished grating elevation)	Basin Cleaning per Section 3-2 plus Section 3-2.03 "Existing Coated Surface" (including Ultra High Pressure Wash and testing to confirm base coat is a competent surface.)	For areas of any concrete damage or spalling, and concrete cracks in walls and floors, repair prior to coating installation per Concrete Crack Repair section. For areas of exposed concrete, prepare per 3-2.01 "Concrete Surfaces"

3-2.01. Concrete Surfaces. Concrete surfaces shall be prepared in accordance with SSPC-SP13/NACE 6. Concrete surfaces shall be prepared until they are acceptable to the lining material manufacturer. Repair of existing concrete shall be per the Concrete Crack Repair section. Surfaces shall be free of cracks, pits, projections, or other imperfections that would interfere with the formation of a smooth, unbroken coating film.

New concrete shall be cured for at least 28 days before lining is applied and shall be ready to receive the lining as determined by the material manufacturer. Concrete repair areas shall be cured before lining is applied. Concrete repair cure time shall be per the recommendations of the approved and applied

concrete repair sealer manufacturer. Concrete surfaces shall be tested for capillary moisture in the concrete in accordance with ASTM D4263. There shall be no capillary moisture migration after 24 hours as determined by the test method. If the manufacturer recommends using the calcium chloride test method to test for capillary moisture migration in the concrete and the test results exceed 3 pounds per 24 hours per 1,000 square feet or more stringent conditions recommended by the lining manufacturer, the corrosion protection system shall include a vapor barrier that is recommended by the protection system manufacturer.

Adhesion testing shall be conducted as specified herein after the concrete surface has been prepared and approved by the lining material manufacturer. Adhesion strength test results shall exceed 400 psi or a higher value if recommended by material manufacturer.

All concrete surfaces to be lined shall be cleaned in accordance with ASTM D4258 and abrasive blasted in accordance with ASTM D4259. Before the lining is applied, the surfaces shall be thoroughly washed or cleaned by air blasting to remove all dust and residue. The Contractor shall repair all concrete surfaces that have spalls, voids, and cracks and shall remove all fins and other surface projections to produce a flush surface for application of the protection system.

Surface profile shall be at least 4 mils for a coating protection system and at least 22 mils for a lining protection system, but shall not be less than 25 percent of the dry film thickness specified for the corrosion protection system or 40-60 grit sandpaper unless recommended otherwise by the material manufacturer.

Concrete surfaces, including those with bug holes less than 1 inch in any dimension, shall be prepared using an epoxy concrete filler or as recommended by the material manufacturer and acceptable to Engineer.

3-2.02. Metal Surfaces. All sharp edges, corners, and welds shall be ground, removing all weld slag and splatter. Welds and sharp edges shall be ground smooth. The surfaces shall be abrasive blasted in conformance with SSPC SP5 to at least a 3 mils surface profile.

3-2.03. Existing Coated Surfaces. Surfaces to be coated with an existing coating shall be prepared per the recommendations of the new coating manufacturer and the requirements of this Section. At minimum, existing coating shall be Ultra High Pressure Washed (30,000 psi minimum) to remove all top (secondary) coats and any loose base coat. During Ultra High Pressure Wash, care must be taken to avoid damage to existing operational chemical feed systems, including existing piping, valves, tanks, electrical and controls, and other appurtenances. In areas where Ultra High Pressure Wash may not be achievable, Contractor shall perform other removal methods as approved by the

Engineer to meet the intent of removing all top (secondary) coats and any loose existing base coat. Upon coating removal for all methods listed above, a minimum of three adhesion tests shall be performed on the remaining existing coated surfaces for each vertical and horizontal surface within a containment basin in accordance with Paragraph 3-5.03. Adhesion tests shall confirm adherence integrity of existing coating prior to installation of new coating. Coating compatibility patch tests shall be performed per ASTM D5064 prior to applying the coating to the existing coating. Allow the test patch to cure for a minimum of 12 days before examination, regardless of the temperature. If either test fails, all existing coatings for the surface tested shall be removed prior to installation of new coating.

3-3. MIXING AND THINNING. Materials shall be thoroughly mixed each time any is withdrawn from the container, and the containers shall be kept tightly closed except while the material is being withdrawn.

Protection system components shall be mixed to proper consistency and viscosity in accordance with the manufacturer's recommendations. Thinning will not be permitted. No adulterant, unauthorized thinner, or other material not included in the formulation, shall be added to the protection system components for any purpose

3-4. APPLICATION. Corrosion protection system shall be applied in accordance with the manufacturer's recommendations and in a neat manner, with finished surfaces free of runs, sags, ridges, laps, and brush marks. In no case shall the wet film thickness of applied protection system be less than the thickness recommended by the material manufacturer.

Grit shall be broadcast into first finish lining coat to produce an anti-skid surface.

Each coat shall be applied over the previous coat in accordance with the recommendations of the material manufacturer. Each coat shall be applied in a manner that will produce an even film of uniform and proper thickness. In no case shall coating be applied at a rate of coverage which is greater than the maximum rate recommended by the material manufacturer.

Recoating shall be applied in accordance with manufacturer's recommendations.

Alternate coats shall be of contrasting colors to facilitate in obtaining complete coverage. The first coat shall be a dark color.

Protection system showing checks, blisters, excessive sags, teardrops, or fat edges will not be acceptable and shall be entirely removed and the surface recoated. The protection system shall be free of pinholes and holidays.

Protection system shall be applied when surface temperature is at least 50°F and at least 5°F above dew point, and relative humidity is 85 percent or lower. Protection system shall not be applied in direct sunlight or when the temperature of the concrete is rising. Preferably the protection system shall be applied when the temperature of the concrete is dropping.

When applying high build protection system with a roller or brush and where a dry film thickness of at least 4 mils per coat is required, two or more coats shall be applied to achieve the recommended dry film thickness equal to a spray applied coating.

For applications over existing construction joints in concrete, Contractor shall perform the following, including meeting the coating manufacturer's recommendations:

- a. Remove the top portion of the existing construction joint filler material, up to a maximum depth of 1.5 inches.
- b. Install corrosion resistant sealant/caulking (Dudick Caulk 149 or equal) within construction joint to create a surface flush with the existing concrete. Sealant/caulking shall be applicable with the specified corrosion protection lining system.
- c. Prime surface above the construction joint with corrosion resistant primer (Dudick Prime 67 or equal) applicable with the specified corrosion protection lining system.
- d. Install corrosion resistant protection lining system, as specified in Part 2.2, to the edges of the construction joint.
- e. Install 12 to 15 mils DFT of a fluoroelastomer coating (Dudick Caulk 100XT or equal) over and 2-inches beyond the construction joint covering the primer and corrosion resistant protection lining system specified.

3-4.01. Epoxy Protection Systems.

3-4.01.01. Epoxy Coating Protection System. Not used.

3-4.01.02. Epoxy Flexible Lining Protection System. The corrosion protection system shall be applied in four or more coats. The system shall consist of one prime coat, one basecoat with reinforcement and saturant, and two or more finish coats. The prime coat shall be at least 6 mils wet film thickness (WFT). The basecoat shall be trowel applied, to a thickness that provides the specified minimum differential movement. The reinforcement shall be pressed firmly into the basecoat, and then saturated with the basecoat resin mixture. Each finish

coat shall be 8 mils dry film thickness (DFT). The protection system shall have a total thickness of at least 90 mils DFT.

3-4.02. Vinyl Ester Protection Systems. Not used.

3-4.03. Vinyl Ester With Graphite Filler Protection Systems.

3-4.03.01. Vinyl Ester With Graphite Filler Coating System. Not used.

3-4.03.02. Vinyl Ester With Graphite Filler Rigid Lining System. Not used.

3-4.03.03. Vinyl Ester With Graphite Filler Flexible Lining System. The corrosion protection system shall be applied in four or more coats. The protection system shall consist of one prime coat, one basecoat, reinforcement and saturant, and two or more finish coats. The prime coat wet film thickness shall be at least 5 mils. The flexible basecoat shall be trowel applied, to a thickness that provides the specified minimum differential movement. The reinforcement shall be pressed firmly into the basecoat, and then saturated with the basecoat resin mixture. Each finish coat shall be 15-20 mils dry film thickness. The protection system shall have a total dry film thickness of at least 100 mils .

3-4.04. Novolac Vinyl Ester Protection Systems. Not used.

3-4.05. Novolac Epoxy Protection Systems.

3-4.05.01. Novolac Epoxy Coating Protection System. Not used.

3-4.05.02. Novolac Epoxy Rigid Lining Protection System. Not used.

3-4.05.03. Novolac Epoxy Flexible Lining Protection Systems. The corrosion protection system shall be applied in four or more coats. The protection system shall consist of one prime coat, one basecoat, reinforcement and saturant, and two or more finish coats. The prime coat wet film thickness shall be at least 4 mils . The basecoat shall be trowel applied, to a thickness that provides the specified minimum differential movement. The reinforcement shall be pressed firmly into the basecoat, and then saturated with the basecoat resin mixture. Each finish coat shall be 15-20 mils dry film thickness. The protection system shall have a total dry film thickness of at least 100 mils .

3-4.06. Corrosion Resistant Caulking/Sealant. Corrosion resistant caulking/sealant shall be used at any penetration in the lining, such as at anchorage of pipe supports and chemical storage tanks.

3-4.07 Topping System. Not used.

3-5. FIELD QUALITY CONTROL. The surfaces shall be cleaned and prepared as needed to properly conduct the visual inspection, spark testing, and adhesion testing. All inspection and testing shall be witnessed by Engineer. Repairs shall be acceptable to Engineer.

3-5.01. Visual Inspection. The surface of the liner shall be visually inspected for areas showing poor adhesion, air inclusion, or other imperfections in the lining that prevent a complete seal of the surfaces.

3-5.02. Spark Testing. All detected holidays and pinholes shall be marked and repaired as recommended by the material manufacturer.

3-5.02.01. Concrete Surfaces. After the linings are applied, the material manufacturer shall spark-test all lined concrete surfaces using a high-voltage electrical spark tester in accordance with ASTM D4787 and set at the recommended voltage, or as a minimum at 100 volts per mil of liner thickness. Before beginning the spark testing the material manufacturer shall verify the testing equipment is working properly. The electrode movement shall be continuous and shall proceed in a systematic manner that will cover 100 percent of the lining surface. A carbon fiber brush shall be used on the sensor electrode.

3-5.02.02. Metal Surfaces. After liners are installed, the material manufacturer shall spark-test all lined metal surfaces using an acceptable high-voltage electrical spark tester set at the recommended voltage. The material manufacturer shall verify the testing equipment is working properly before beginning the spark testing of the lining. The electrode movement shall be continuous and shall proceed in a systematic manner that will cover 100 percent of the lining surface.

3-5.03. Adhesion Testing. An adhesion test shall be conducted on all epoxy, vinyl ester with graphite fill, and novolac epoxy protection systems specified herein. For each protection system and each surface type, adhesion testing shall be conducted before application of the lining, on a properly prepared surface that is acceptable to the material manufacturer and Engineer. The test area shall be at least 2 square feet to allow a minimum of three tests to be conducted on each vertical and horizontal surface. The test area shall be coated with the specified system and cured as recommended by the material manufacturer. Pull-off strength adhesion tests shall be conducted by the material manufacturer in accordance with ASTM D7234 for concrete surfaces using an Elcometer tensile adhesion tester. At least three adhesion tests shall be conducted and the results averaged. Adhesion strength shall equal or exceed the minimum adhesion strength recommended by the material manufacturer and shall exceed the tensile strength of the concrete.

If the lining fails the adhesion test, the cause of the failure shall be determined and corrected before the test is repeated.

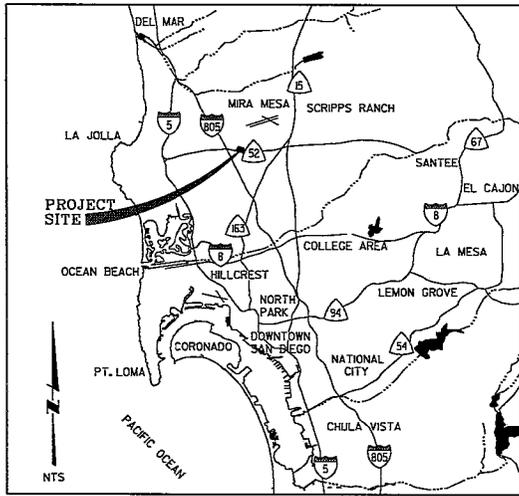
3-6. PROTECTION. Care shall be taken to prevent coating from being dropped or spilled on adjacent surfaces, buildings, structures, or facilities. All surfaces so damaged shall be cleaned, repaired, replaced, or painted as acceptable to Engineer.

End of Section

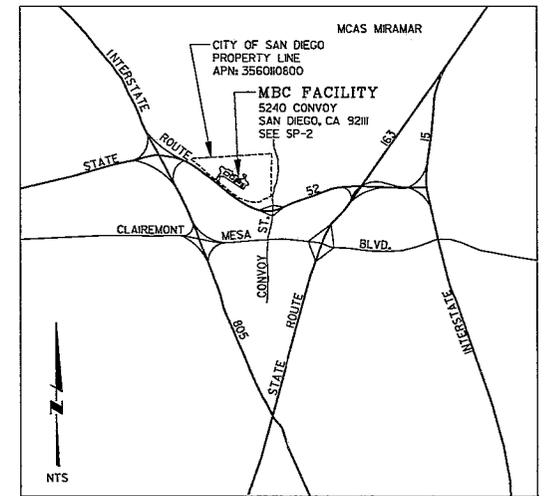
PUBLIC WORKS DEPARTMENT

City of San Diego

METROPOLITAN BIOSOLIDS CENTER CHEMICAL SYSTEMS IMPROVEMENTS PHASE II



VICINITY MAP



LOCATION MAP

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 PREVIEW ONLY AND DOES NOT RELIEVE ME, AS ENGINEER OF WORK, OF MY RESPONSIBILITIES FOR THE PROJECT DESIGN.

David A. Cover
DAVID A. COVER

11/26/14
DATE

NOVEMBER 2014

PLANS FOR THE CONSTRUCTION OF
METROPOLITAN BIOSOLIDS CENTER
CHEMICAL SYSTEMS IMPROVEMENTS PHASE II

COVER SHEET

CONSTRUCTION CHANGE / ADDENDUM		APPROVAL NO.	
CHANGE	DATE	AFFECTED OR ADDED SHEET NUMBERS	
C	5/7/15	5, 6, 39, 66, 67, 79, 93, III	

WARNING
IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE.

CITY OF SAN DIEGO
PUBLIC WORKS PROJECT



CONSULTANT BLACK & VEATCH Building a world of difference. Black & Veatch Corporation 10089 WILLOW CREEK ROAD, SUITE 350 SAN DIEGO, CA 92131 Ph 760-621-8600 Fax 760-621-8602		CITY OF SAN DIEGO, CALIFORNIA PUBLIC WORKS DEPARTMENT SHEET 1 OF 170 SHEETS DATE: 11/26/14 FOR CITY ENGINEER: RAJ ASHARZADEH DATE: 3/6/15 DESIGNER: Jorge A. Leryna PROJECT ENGINEER: 246-1719 CHECK COORDINATOR: 1896-6279 COST COORDINATOR: 37240-1-D	
CONSTRUCTION SITE STORM WATER PRIORITY INSPECTION FREQUENCY: HIGH ... MEDIAN ... LOW ... SPEC. NO. 1-S-628-080-3		CONTRACTOR: [Signature] INSPECTOR: [Signature]	

METROPOLITAN BIOSOLIDS CENTER CHEMICAL SYSTEMS IMPROVEMENTS PHASE II

GENERAL NOTES

- EXISTING UTILITIES, PIPING, AND STRUCTURES (UNDERGROUND, SURFACE, OR OVERHEAD) ARE INDICATED ONLY TO THE EXTENT THAT SUCH INFORMATION WAS KNOWN, OR MADE AVAILABLE TO, OR DISCOVERED BY THE ENGINEER IN PREPARING THE DRAWINGS. THE LOCATIONS, CONFIGURATIONS, AND ELEVATIONS OF SUBSURFACE FACILITIES AND UTILITIES ARE APPROXIMATE, AND NOT ALL UTILITIES AND FACILITIES MAY BE INDICATED. OVERHEAD UTILITIES ARE NOT INDICATED IN ELEVATIONS, PROFILE OR SECTION DRAWINGS. THE ENGINEERING INVESTIGATIONS, LOCATION, AND DESIGNATION OF SUBSURFACE UTILITIES INDICATED IN THESE CONTRACT DOCUMENTS HAS BEEN PERFORMED TO QUALITY LEVEL C IN ACCORDANCE WITH GENERALLY ACCEPTED ENGINEERING PRINCIPLES AND PRACTICES AS OUTLINED IN ASCE STANDARD AND GUIDELINE BULLETIN C/ASCE 38-02 UNLESS OTHERWISE DESIGNATED. WHERE SUCH ACTIVITIES HAVE BEEN TO A HIGHER LEVEL OF QUALITY, THE HIGHER QUALITY LEVEL FOR THE AFFECTED AREAS IS INDICATED IN THE CONTRACT DOCUMENTS.
- "SCREENED" LIGHT DELINEATION INDICATED ON THE DRAWINGS DENOTES EXISTING FACILITIES. "SCREENED" INFORMATION WAS TAKEN FROM EXISTING CONSTRUCTION DRAWINGS AND DATA (AS-BUILTS), IS FOR REFERENCE ONLY, AND SHALL BE FIELD VERIFIED BY THE CONTRACTOR PRIOR TO THE ORDERING OF MATERIALS AND BEGINNING OF CONSTRUCTION. "BOLD" DELINEATION IS NEW WORK TO BE CONSTRUCTED UNDER THIS CONTRACT.
- CONTRACTOR'S STAGING, PARKING AND MATERIAL STORAGE SHALL BE LIMITED TO THE SPACES DESIGNATED ON THE DRAWINGS. PROVIDING ADDITIONAL STORAGE OR PARKING SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR.
- BEFORE CONSTRUCTION IS STARTED, CONTRACTOR SHALL COORDINATE WITH THE OWNER OF EACH UTILITY AND DEFINE THE REQUIREMENTS AND METHODS TO ACCOMMODATE THE PROTECTION, TEMPORARY SUPPORT, ADJUSTMENT, OR RELOCATION OF ANY UTILITIES AFFECTED BY THE PROPOSED NEW WORK.
- THE DRAWINGS INDICATE TYPES OF PIPE SUPPORT SYSTEMS AT VARIOUS LOCATIONS. CONTRACTOR SHALL NOT DELETE OR RELOCATE THE SUPPORTS, EXPANSION JOINTS OR COUPLINGS INDICATED ON THE DRAWINGS WITHOUT ENGINEER'S WRITTEN APPROVAL. HOWEVER, ALL PIPE SUPPORTS, HANGERS, BRACKETS, INSERTS OR BRACES ARE NOT SHOWN. CONTRACTOR SHALL REFER TO THE SPECIFICATIONS AND PROVIDE A COMPLETE SUPPORT SYSTEM AS REQUIRED.
- THE TERM "PROPOSED" AS INDICATED ON THE DRAWINGS MEANS THE ITEM IS DESIGNED OR PLANNED TO BE PROVIDED BY OWNER OR OTHERS SEPARATE FROM THIS CONTRACT. THE TERM "FUTURE" AS INDICATED ON THE DRAWINGS REFERS TO THE ENGINEER'S INTERPRETATION OF THE ITEM FOR THE FUTURE, BASED ON AVAILABLE INFORMATION.
- THE EXISTING PROCESS FACILITIES SHALL REMAIN IN OPERATION CONTINUOUSLY THROUGHOUT THE CONSTRUCTION ACTIVITIES. INDIVIDUAL PROCESS FACILITIES CAN BE TAKEN OUT OF SERVICE FOR LIMITED PERIODS OF TIME TO FACILITATE CONSTRUCTION AS SPECIFIED IN THE CONTRACT DOCUMENTS.
- HIGH POINTS IN PIPELINES WILL NOT BE PERMITTED EXCEPT AT LOCATIONS OF AIR VALVES OR STRUCTURE OUTLETS AS INDICATED ON THE DRAWINGS. REVIEW THE PIPELINE REQUIREMENTS WITH THE ENGINEER PRIOR TO PREPARING LAYING SCHEDULES.
- CONTRACTOR SHALL FIELD VERIFY PRECISE LOCATION, ELEVATION, AND ARRANGEMENT OF CONNECTIONS OF NEW PIPELINES WITH EXISTING PIPELINES BASED ON FIELD CONDITIONS, INCLUDING EXPOSING EXISTING PIPING PRIOR TO FABRICATING NEW PIPING. CONTRACTOR TO VERIFY MATERIALS OF EXISTING PIPE. CONTRACTOR SHALL PROVIDE FITTINGS, ADAPTERS, SLOTTED SLEEVE CLOSURES, AND HARNESS MECHANICAL COUPLING. ROTATE FITTINGS DEFLECT JOINTS AND MODIFY EXISTING PIPING AS APPLICABLE AND AS REQUIRED TO MAKE CONNECTIONS, INCLUDING ADJUSTMENTS FOR ANY OFFSETS IN CENTERLINE ELEVATIONS BETWEEN PIPELINES. CONTRACTOR TO LOCATE EXISTING PIPE JOINTS AND REMOVE EXISTING PIPING TO MOST APPROPRIATE JOINT TO MAKE CONNECTION. CONNECTIONS TO THE MIDDLE OF PIPE BARRELS ARE NOT ALLOWED. CONTRACTOR SHALL PROVIDE TEMPORARY PLUG WITH FACTORY OUTLET SIZED AS REQUIRED FOR CONTRACTOR'S TESTING AND DISINFECTION WORK BEFORE MAKING CONNECTION, WHEN APPLICABLE. CONTRACTOR SHALL COORDINATE MAKING EACH CONNECTION WITH THE OWNER.
- ALL STEEL CONNECTIONS REFERENCED ON THIS PROJECT SHALL BE TYPE 316 STAINLESS STEEL UNLESS OTHERWISE INDICATED.
- DEMOLITION WORK SHALL NOT BE PERFORMED UNTIL APPROVAL OF THE CONTRACTOR'S CONSTRUCTION SEQUENCING PLAN(S) PER SPECIFICATION 01030 IS GRANTED BY THE ENGINEER. ALL DEMOLITION WORK SHALL BE COORDINATED AND SCHEDULED WITH THE ENGINEER AND PLANT PERSONNEL AND SHALL BE PERFORMED IN A MANNER THAT ALLOWS THE PLANT TO REMAIN IN CONTINUOUS UNINTERRUPTED OPERATION. BRIEF INTERRUPTION MAY BE GRANTED TO A SYSTEM PENDING ENGINEER APPROVAL. WORK SHALL BE DONE IN ACCORDANCE WITH SPECIFICATION 01030.
- LIMITS OF DEMOLITION SHOWN ON DRAWINGS IS APPROXIMATE. CONTRACTOR TO DETERMINE FINAL LIMITS AS APPROPRIATE TO COMPLETE THE WORK. GENERAL ITEMS TO BE SALVAGED AND TURNED OVER TO THE CITY FORCES INCLUDE: VALVE ACTUATOR. OTHER ITEMS TO BE SALVAGED MAY BE NOTED ON INDIVIDUAL DRAWINGS OR IN THE SPECIFICATIONS.
- NO MATERIALS OR EQUIPMENT SHALL BE STORED WHERE IT WILL PREVENT FREE AND SAFE PASSAGE OF PLANT STAFF.
- THE CONTRACTOR SHALL BE RESPONSIBLE FOR ANY DAMAGE TO EXISTING FACILITIES AS A RESULT OF CONTRACTOR'S OPERATIONS, AND SHALL HAVE ON SITE SUFFICIENT MATERIALS AND EQUIPMENT TO IMMEDIATELY REPAIR AND DAMAGE TO EXISTING FACILITIES.
- SEE WORK PLANNING NOTE 1 ON DWG SP-2.

GENERAL FIRE SPRINKLER/ALARM NOTES

- THE PROPOSED PROJECT IMPROVEMENTS DO NOT INCLUDE, NOR ANTICIPATE, ANY MODIFICATIONS TO THE EXISTING FIRE EXTINGUISHING SYSTEMS. IF MODIFICATIONS ARE DETERMINED TO BE REQUIRED BY THE CONTRACTOR TO ALLOW FOR THE GENERAL PROJECT IMPROVEMENTS, THE FIRE EXTINGUISHING PLANS, INCLUDING ANY FIRE SPRINKLER SYSTEM AND FIRE ALARM MODIFICATIONS, SHALL BE DEFERRED TO THE CONTRACTOR, AT THEIR EXPENSE, AND SHALL BE SUBMITTED PRIOR TO CONSTRUCTION. IF THE CONTRACTOR DOES NOT ALTER OR ADD ANY FIRE SPRINKLERS OR ADDS OR ALTERS 20 OR FEWER SPRINKLERS, THE CONTRACTOR SHALL SUBMIT AN AFFIDAVIT FOR FIRE SPRINKLER ALTERATIONS OR TENANT IMPROVEMENTS (FORM DS-161).
- COMPLETE PLANS AND SPECIFICATIONS FOR ALL FIRE EXTINGUISHING SYSTEMS, INCLUDING AUTOMATIC SPRINKLER AND STANDPIPE SYSTEMS AND OTHER SPECIAL FIRE EXTINGUISHING SYSTEMS AND RELATED APPURTENANCES SHALL BE SUBMITTED TO THE CITY OF SAN DIEGO FOR REVIEW AND APPROVAL PRIOR TO INSTALLATION. CFC 901.2
- COMPLETE PLANS AND SPECIFICATIONS FOR FIRE ALARM SYSTEMS SHALL BE SUBMITTED TO THE CITY OF SAN DIEGO DEVELOPMENT SERVICES FOR REVIEW AND APPROVAL PRIOR TO INSTALLATION. CFC 907.11
- DURING CONSTRUCTION, AT LEAST ONE EXTINGUISHER SHALL BE PROVIDED ON EACH FLOOR LEVEL AT EACH STAIRWAY, IN ALL STORAGE AND CONSTRUCTION SHEDS, IN LOCATIONS WHERE FLAMMABLE OR COMBUSTIBLE LIQUIDS ARE STORED OR USED, AND WHERE OTHER SPECIAL HAZARDS ARE PRESENT PER CFC 1415.1.

"THE FOLLOWING PROJECT DATA IS FROM THE ORIGINAL MBC FACILITY CONSTRUCTED IN 1999 PER CITY DRAWING 2733-009-D CIP PROJECT NO. 42-98-09. ALL NEW STRUCTURAL UPGRADES ARE PER THE CODES LISTED ON DRAWING R-33 (INCLUDING 2010 CALIFORNIA BUILDING CODE AS AMENDED BY THE CITY OF SAN DIEGO.)"

PROJECT DATA	
CHEMICAL STORAGE BUILDING - AREA 60	
APPLICABLE CODE :	1991 UNIFORM BUILDING CODE CALIFORNIA CODE REGULATIONS 9 & 24 1990 AMERICANS WITH DISABILITIES ACT
OCCUPANCY CLASSIFICATION:	B2/H7
TYPE CONSTRUCTION :	VN - FULLY SPRINKLED
HEIGHTS AND LIMITS:	
ALLOWABLE AREA:	24,000 S.F.
ACTUAL AREA:	20,520 S.F.
NUMBER OF STORIES :	1
ALLOWABLE HEIGHT:	40'-0"
ACTUAL HEIGHT:	30'-0"
STRUCTURAL FIRE RESISTANCE REQUIREMENTS:	
A. STRUCTURAL FRAME	E. WALLS
1. BEAMS N	1. EXTERIOR LOAD BEARING N
2. COLUMNS N	2. EXTERIOR NON LOAD BEARING N
B. FLOORS N	3. INTERIOR LOAD BEARING N
1. FLOORS/CEILING N	4. INTERIOR N
C. SHAFT ENCLOSURES	5. EXIT PASSAGE WAYS 1 HOUR
1. VERTICAL SHAFTS 1 HOUR	
2. OPENINGS INTO SHAFTS 1 HOUR	
D. ROOF DECKS N	
1. ROOF DECK N	
2. ROOF SURFACING CLASS A	

WATER POLLUTION CONTROL NOTES:

- THE CONTRACTOR SHALL COMPLY WITH THE REQUIREMENTS NOTED IN THE GREENBOOK 2012 CITY SUPPLEMENT SEC 701-WATER POLLUTION CONTROL.

STORM WATER PROTECTION NOTES

- THIS PROJECT IS SUBJECT TO MUNICIPAL STORM WATER PERMIT ORDER NO. 2009-0009-DWG; AND RISK LEVEL/TYPE: CHECK ONE BELOW

<input checked="" type="checkbox"/> WPCP	<input type="checkbox"/> CGP RISK LEVEL 1	<input type="checkbox"/> CGP LUP TYPE 1
<input type="checkbox"/> CGP RISK LEVEL 2	<input type="checkbox"/> CGP RISK LEVEL 3	<input type="checkbox"/> CGP LUP TYPE 2
<input type="checkbox"/> CGP RISK LEVEL 3		<input type="checkbox"/> CGP LUP TYPE 3
- CHECK ONE

<input type="checkbox"/> THIS PROJECT WILL EXCEED THE MAXIMUM DISTURBED AREA LIMIT. THEREFORE A WEATHER TRIGGERED ACTION PLAN (WTAP) IS REQUIRED.
<input type="checkbox"/> THIS PROJECT WILL FOLLOW PHASED GRADING NOT TO EXCEED FIVE (5) ACRES PER PHASE.
<input checked="" type="checkbox"/> NOT APPLICABLE.
- THE CONTRACTOR SHALL COMPLY WITH THE REQUIREMENTS OF THE WPCP OR SWPPP AS APPLICABLE.

GENERAL SCOPE OF WORK

AREA 60 - CHEMICAL BUILDING

- RECONFIGURE POLYMER PUMP AREA SUCTION AND DISCHARGE PIPING.
- RECONFIGURE THICKENING POLYMER BULK STORAGE TANKS PIPING.
- DEMOLITION OF EXISTING DILUTION POLYMER SYSTEMS.
- POLYMER TRANSFER AREA: INSTALL NEW POLYMER TRANSFER PUMP WHILE UPSIZING PUMP SUCTION AND DISCHARGE PIPING.
- FERRIC AND FERROUS CHLORIDE: RECONFIGURE CHEMICAL BULK STORAGE TANKS AND TRANSFER PUMPS PIPING CONFIGURATION.
- SULFURIC ACID: DEMOLISH EXISTING TRANSFER PUMPS AND RECONFIGURE BULK STORAGE TANK PIPING.
- SODIUM HYPOCHLORITE: PIPING RECONFIGURATION.
- CAUSTIC SODA: PIPING RECONFIGURATION.
- BUILDING INTERIOR CONTAINMENT BASINS: REMOVE EXISTING COATING AND INSTALL NEW COATING ON INTERIOR CONTAINMENT BASIN WALLS AND FLOORS.
- TANK FARM: INSTALL NEW CATWALK ACCESS PLATFORMS, HANDRAIL AND LADDER RELOCATIONS.
- TANK FARM: RELOCATE FOUR (4) EXISTING EYEWASH SHOWERS.
- TANK FARM: REMOVE EXISTING COATING AND INSTALL NEW COATING ON INTERIOR CONTAINMENT BASIN WALLS AND FLOORS.
- ELECTRICAL & INSTRUMENTATION: INSTALL NEW CONDUITS, CABLE, WIRING, CIRCUITS AND CONDUCTORS TO ACCOMMODATE NEW PIPING AND VALVES, AND TO RELOCATE ABOVE SPILL CONTAINMENT LEVELS.

AREA 76 - CENTRIFUGE BUILDING

- FERRIC CHLORIDE DAY TANKS: DEMOLISH ALL EXISTING PUMPS, RACKS, AND PIPING BACK TO THE TANK FLANGE.
- POLYMER DILUTION PIPING: RECONFIGURE POLYMER PIPING
- FERRIC CHLORIDE: REPLACE ANY EXPOSED SINGLE WALL PIPE THAT IS NOT IN A CONTAINED AREA WITH DOUBLE CONTAINED PIPE, WHILE ADDING LEAK DETECTION SYSTEMS ON NEW DOUBLE WALL PIPING IN AREAS AS INDICATED ON THE DRAWINGS.
- BUILDING INTERIOR CONTAINMENT BASINS: REMOVE EXISTING COATING AND INSTALL NEW COATING ON INTERIOR CONTAINMENT BASIN WALLS AND FLOORS.
- ELECTRICAL & INSTRUMENTATION: DEMOLISH AND TERMINATE FERRIC CHLORIDE SYSTEM EQUIPMENT AND CONDUITS.

AREA 80 - DIGESTER COMPLEX/PIPE GALLERY

- FERROUS CHLORIDE: REPLACE ANY EXPOSED SINGLE WALL PIPE THAT IS NOT IN A CONTAINED AREA WITH DOUBLE CONTAINED PIPE, WHILE ADDING LEAK DETECTION SYSTEMS ON NEW DOUBLE WALL PIPING IN AREAS AS INDICATED ON THE DRAWINGS.
- FERROUS CHLORIDE DAY TANK ROOM: NEW ADDITIONAL PUMP AND PIPING RECONFIGURATION.
- BUILDING INTERIOR CONTAINMENT BASINS: REMOVE EXISTING COATING AND INSTALL NEW COATING ON INTERIOR CONTAINMENT BASIN WALLS AND FLOORS.
- ELECTRICAL & INSTRUMENTATION: INSTALL NEW CONDUITS, CABLE, WIRING, CIRCUITS AND CONDUCTORS TO ACCOMMODATE NEW PIPING AND VALVES, AND TO RELOCATE ABOVE SPILL CONTAINMENT LEVEL.

R-2

PLANS FOR THE CONSTRUCTION OF
METROPOLITAN BIOSOLIDS CENTER
CHEMICAL SYSTEMS IMPROVEMENTS PHASE II

GENERAL NOTES

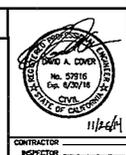
CITY OF SAN DIEGO, CALIFORNIA PUBLIC WORKS DEPARTMENT SHEET 5 OF 170 SHEETS		WATER JOB BI0178
DATE: 11/26/11	BY: J. L. LORRINO	PROJECT ENGINEER
FOR CITY ENGINEER: [Signature]	DATE: 11/26/11	PROJECT ENGINEER
BY: [Signature]	DATE: 11/26/11	PROJECT ENGINEER
DESCRIPTION	BY	APPROVED
REVISION	DATE	FILED
246-1719	3/1/15	
1886-6219		
37240-5-D		

CONSULTANT



BLACK & VEATCH
Building a world of difference.

Black & Veatch Corporation
10089 WILLOW CREEK ROAD, SUITE 350
SAN DIEGO, CA 92131
Ph 760-621-8600 Fax 760-621-8602



GENERAL

- THE CONTRACTOR SHALL VERIFY ALL DIMENSIONS, ELEVATIONS AND CONDITIONS AT THE JOB SITE BEFORE STARTING WORK, AND SHALL NOTIFY THE STRUCTURAL ENGINEER IMMEDIATELY OF ANY DISCREPANCIES.
- ALL OMISSIONS OR CONFLICTS BETWEEN THE VARIOUS ELEMENTS OF THE DRAWINGS AND SPECIFICATIONS SHALL BE BROUGHT TO THE ATTENTION OF THE ENGINEER BEFORE PROCEEDING WITH ANY WORK SO INVOLVED.
- NOTES AND DETAILS ON THE STRUCTURAL DRAWINGS SHALL TAKE PRECEDENCE OVER THESE GENERAL NOTES AND TYPICAL DETAILS IN CASE OF CONFLICT.
- IN NO CASE SHALL WORKING DIMENSIONS BE SCALED FROM PLANS, SECTIONS OR DETAILS OF THESE STRUCTURAL DRAWINGS.
- ALL MATERIALS AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH LOCAL STANDARDS AND THE APPLICABLE PROVISIONS OF THE 2010 CALIFORNIA BUILDING CODE (CBC) AS AMENDED BY THE CITY OF SAN DIEGO.
- WHERE NO CONSTRUCTION DETAILS ARE SHOWN OR NOTED FOR ANY PART OF THE WORK, SUCH DETAILS SHALL BE THE SAME AS FOR SIMILAR WORK SHOWN ON THE DRAWINGS. MEMBER SIZES ARE GENERALLY FOUND ON PLANS, DETAILS AND SECTIONS GENERALLY REFER TO GENERIC ELEMENTS.
- THE CONTRACT STRUCTURAL DRAWINGS AND SPECIFICATIONS REPRESENT THE FINISHED STRUCTURE, UNLESS OTHERWISE INDICATED. THEY DO NOT INDICATE THE METHOD OF CONSTRUCTION. THE CONTRACTOR SHALL PROVIDE ALL MEASURES NECESSARY TO PROTECT THE STRUCTURE, WORKMEN AND OTHER PERSONS DURING CONSTRUCTION. SUCH MEASURES SHALL INCLUDE, BUT NOT BE LIMITED TO, BRACING, SHORING FOR CONSTRUCTION EQUIPMENT, SHORING FOR THE BUILDING, SHORING FOR EARTH BANKS, FORMS, SCAFFOLDING, PLANKING, SAFETY NETS, SUPPORT AND BRACING FOR CRANES AND ON POLES, ETC. THE CONTRACTOR SHALL SUPERVISE AND DIRECT THE WORK AND HE OR SHE SHALL BE SOLELY RESPONSIBLE FOR ALL CONSTRUCTION MEANS, METHODS, TECHNIQUES, SEQUENCES AND PROCEDURES. OBSERVATION VISITS TO THE SITE BY THE ENGINEER SHALL NOT CONSTITUTE INSPECTION OF THE ABOVE ITEMS.
- THE PROJECT SPECIFICATIONS FORM A PART OF THESE GENERAL NOTES.
- NOTIFY THE STRUCTURAL ENGINEER WHEN DRAWINGS BY OTHERS SHOW OPENINGS, POCKETS, ETC. NOT SHOWN ON THE STRUCTURAL DRAWINGS, BUT WHICH ARE LOCATED IN THE STRUCTURAL MEMBERS.
- THE CONTRACTOR IS RESPONSIBLE FOR PROTECTING EXISTING UTILITIES IN THE WORK AREA AND SHALL REPAIR ANY DAMAGE CAUSED BY HIS OR HER OPERATIONS AT HIS OR HER OWN COST.
- ALL SPECIFICATIONS AND CODES NOTED SHALL BE THE LATEST APPROVED EDITIONS AND REVISIONS BY THE GOVERNMENTAL AGENCY HAVING JURISDICTION OVER THIS PROJECT.
- SEE MECHANICAL, PLUMBING, AND ELECTRICAL DRAWINGS FOR THE FOLLOWING:
PIPE SLEEVES, HANGERS, ETC. EXCEPT AS SHOWN OR NOTED.
ELECTRICAL CONDUIT RUNS, BOXES, OUTLETS IN WALLS.
SIZE AND LOCATION OF MACHINE OR EQUIPMENT BASES, ANCHOR BOLTS FOR MOUNTS.
- CONSTRUCTION MATERIALS SHALL BE SPREAD OUT WHEN PLACED ON FRAMED FLOORS OR ROOFS. THE CONSTRUCTION MATERIAL LOAD SHALL NOT EXCEED THE DESIGN LIVE LOAD PER SQUARE FOOT. PROVIDE ADEQUATE SHORING AND/OR BRACING WHERE STRUCTURE HAS NOT ATTAINED DESIGN STRENGTH.
- SHOP DRAWINGS SUBMITTED TO THE STRUCTURAL ENGINEER FOR REVIEW SHALL CONSIST OF 2 BLUELINE SETS MINIMUM.
- ALL NEW SURFACES, CORNERS, EDGES, EXPOSED BOLTS, ETC. AT NEW WALKWAYS (PARTICULARLY IN TRAVEL PATHS) SHALL BE FREE OF SHARP EDGES AND SHALL BE ROUNDED SMOOTH.

DESIGN CRITERIA

- LIVE LOADS: PLATFORMS 100 P.S.F.

DESIGN CODES

- 2010 CALIFORNIA BUILDING CODE (CBC) AS AMENDED BY THE CITY OF SAN DIEGO.
- AISC MANUAL FOR STEEL CONSTRUCTION, 13TH EDITION.

STRUCTURAL STEEL (PLATFORMS)

- ALL STRUCTURAL STEEL WIDE FLANGE BEAMS AND GIRDERS SHALL CONFORM TO ASTM A992, GRADE 50 U.O.N. AND SHALL BE FABRICATED ACCORDING TO AISC PRACTICE AND SPECIFICATIONS FOR BUILDINGS UNLESS OTHERWISE SPECIFIED.
- STRUCTURAL STEEL PLATES, CHANNELS, AND ANGLES SHALL CONFORM TO ASTM A56, Fy = 36 K.S.I.
- ALL STRUCTURAL HOLLOW TUBES SHALL CONFORM TO ASTM A 500 GRADE B. STEEL PIPE SHALL CONFORM TO ASTM A53, GRADE B.
- BOLTS SHALL CONFORM TO ASTM A325, U.O.N. ALL BOLTS SHALL BE INSTALLED WITH CUT STEEL WASHERS. BOLT HOLES SHALL BE 1/16-INCH OVERSIZED.
- ALL WELDING SHALL BE PERFORMED BY CERTIFIED OPERATORS UNDER THE SUPERVISION OF AN APPROVED FABRICATOR USING THE ELECTRIC SHIELDED ARC PROCESS AS FORMULATED BY THE AMERICAN WELDING SOCIETY.
- STEEL SHALL BE IDENTIFIED BY HEAT OR MELT NUMBERS AND SHALL BE ACCOMPANIED BY TEST REPORTS.
- AISC STANDARD BEAM CONNECTIONS SHALL BE USED FOR CONNECTIONS NOT SHOWN (AISC 13TH EDITION OR EQUAL) USING 3/4-INCH BOLTS.
- ALL STEEL SHALL BE FABRICATED TO FIT TOGETHER PLUMB AND TRUE IN THE FIELD WITHOUT ALTERATION.
- WELDING ELECTRODES FOR MANUAL SHIELDED METAL-ARC WELDING SHALL CONFORM TO SPECIFICATIONS FOR MILD STEEL COVERED ARC WELDING ELECTRODES, AWS A5.1, OR SPECIFICATION FOR LOW-ALLOY STEEL COVERED ARC-WELDING ELECTRODES AWS A5.5. ELECTRODES SHALL BE E70 SERIES.
- ELECTRODES USED IN THE GAS METAL ARC PROCESS SHALL CONFORM TO SPECIFICATION FOR MILD STEEL ELECTRODES FOR GAS METAL-ARC WELDING AWS A5.8.
- ALL TESTING AND WELDING OF STRUCTURAL STEEL AND ALL CERTIFICATION OF WELDERS SHALL BE PER AWS D11. REFER TO SPECIAL INSPECTION NOTES FOR ADDITIONAL WELDING REQUIREMENTS.
- STRUCTURAL STEEL SURFACES SHALL BE HOT DIPPED GALVANIZED AND COATED PER SPECIFICATION 0994C. COATING SHALL BE SYSTEM AT PER PART 3-8 FOR GALVANIZED SURFACES.
- EXCEPT AS SUBSEQUENTLY NOTED, HIGH STRENGTH BOLTS NEED NOT BE TIGHTENED BEYOND THE SNUG-TIGHT CONDITION, AS DEFINED IN SECTION J3.1 OF AISC 360-05 AND RESEARCH COUNCIL ON STRUCTURAL CONNECTIONS (RCSC) SPECIFICATION FOR CONNECTIONS SUBJECT TO DIRECT TENSION AND OTHER CONNECTIONS SHOWN OR NOTED ON THE PLANS AS S.C. (SLIP CRITICAL) OR FULLY TENSIONED BOLTS SHALL BE TIGHTENED BY ONE OF THE METHODS DESCRIBED IN SECTION J3.1 (AISC 360-05) AND TO THE MINIMUM TENSION SPECIFIED IN TABLE J3.1 (AISC 360-05).
- BASE PLATES SHALL BE BEDDED WITH A MINIMUM OF 1-INCH DRYPACK GROUT (NON-SHRINK GROUT).

GROUT FOR COLUMN BASES

- GROUT SHALL BE NON-SHRINK TYPE CONFORMING TO ASTM C1017 WITH A 28-DAY COMPRESSION STRENGTH EQUAL TO 7000 P.S.I.MIN.
- GROUTING PROCEDURES, INCLUDING PREPARATION, MIXING, PLACING AND CURING, SHALL BE AS RECOMMENDED BY THE MANUFACTURER OF THE GROUT.
- DATA FOR GROUT SHALL BE SUBMITTED FOR APPROVAL. PRODUCT SHALL BE SPECIFICALLY DESIGNED FOR THE USE AND PROCEDURES PROPOSED.
- GROUT SHALL NOT CONTAIN METALLIC AGGREGATES AND SHALL BE FREE OF AGENTS THAT PRODUCE OR RELEASE GAS, BE FREE OF OXIDIZING CATALYSTS AND BE FREE OF INORGANIC ACCELERATORS.
- GROUT SHALL BE FORMED USING WATER-TIGHT FORMS.

FIBERGLASS PLASTIC (GRATING AND LADDERS)

- PLATFORM DECKING:
 - MANUFACTURED GRATING 1/2 INCH HIGH, LOAD RATED FOR 125 P.S.F.
 - CUT TO LENGTH IN FIELD.
 - BUTT ENDS SHALL BE CENTERED ON FRAMING.
 - FASTEN EACH PIECE, EACH BEARING.
- LADDER LOAD RATED FOR 500 LBS.
- FURNISH ALL NECESSARY ANCHORAGE DEVICES AND FASTENERS FOR COMPLETE INSTALLATION.

ALUMINUM (GUARDRAILS)

- FOR STRUCTURAL ALUMINUM, USE ALLOY 6061-T6, DETAILED AND FABRICATED IN ACCORDANCE WITH THE LATEST SPECIFICATIONS FOR STRUCTURES OF ALUMINUM ALLOY 6061-T6, PUBLISHED BY AISC.
- SHOP CONNECTIONS MAY BE BOLTED OR WELDED UNLESS THE CONNECTIONS METHOD IS INDICATED ON THE DRAWINGS.
- MAKE SHOP CONNECTION, UNLESS WELDED, AND FIELD CONNECTIONS WITH 3/4-INCH DIAMETER, TYPE 316 STAINLESS STEEL BOLTS.
- PAINT ALUMINUM IN CONTACT WITH CONCRETE WITH BITUMINOUS PAINT.
- PROVIDE DISSIMILAR METAL PROTECTION AT ALL BOLT LOCATIONS AND OTHER LOCATIONS WHERE DISSIMILAR METALS MEET. THE PROTECTION SHALL BE ONE COAT, MINIMUM 4-MIL DRY THICKNESS OF ZINC CHROMATE PRIMER ON THE ALUMINUM SURFACES. APPLY ONE COAT OF ALL-METAL PRIMER, MINIMUM 3-MIL DRY THICKNESS, TO THE DISSIMILAR METAL U.O.N.
- RAILINGS:
 - STANDARD 1-1/4 PIPE CONSTRUCTION.
 - WELD ALL INTERSECTIONS ALL AROUND.
 - CLOSE ALL ENDS.
 - GRIND SMOOTH SO THAT THERE ARE NO ROUGH EDGES.

DRILLED IN ANCHORS

- ALL ANCHORS SHALL BE ICC APPROVED.
- ALL ANCHORS SHALL BE INSTALLED IN STRICT ACCORDANCE WITH MANUFACTURERS APPROVED RESEARCH REPORT. SUBSTITUTIONS ARE NOT ALLOWED WITHOUT WRITTEN APPROVAL BY THE ENGINEER OF RECORD, BECAUSE CONDITIONS OF USE IN RESEARCH REPORTS MAY VARY.
- DRILLED IN CONCRETE WEDGE ANCHORS SHALL BE: HILTI-B-TZ ESR #917
RAMSET TRUBOLT ESR #2427
SIMPSON STRONG BOLT ESR #171
- UNLESS OTHERWISE SHOWN, PROVIDE A MINIMUM OF 6XDIAMETER EDGE DISTANCES AND 12XDIAMETER SPACING OF ANCHORS.
- DRILLED IN ANCHORS SHALL BE STAINLESS STEEL.
- SPECIAL INSPECTION IN ACCORDANCE WITH SECTION 1704A OF THE CBC MUST BE PROVIDED FOR ALL ANCHOR INSTALLATIONS. THE SPECIAL INSPECTOR MUST BE ON THE JOBSITE DURING ANCHOR INSTALLATION TO VERIFY ANCHOR TYPE, ANCHOR DIMENSIONS, CONCRETE TYPE, CONCRETE COMPRESSIVE STRENGTH, HOLE DIMENSIONS, HOLE CLEANING PROCEDURES, ANCHOR SPACING, EDGE DISTANCES, CONCRETE THICKNESS, ANCHOR EMBEDMENT, AND TIGHTENING TORQUE. THE SPECIAL INSPECTOR MUST VERIFY THE INSTALLATIONS OF EACH TYPE AND SIZE OF ANCHOR BY CONSTRUCTION PERSONNEL ON SITE.

DRILLED IN ADHESIVE ANCHORS (EPOXY)

- INSTALL ANCHORS IN CONFORMANCE WITH ICC-ESR APPROVAL.
- DRILLED IN CONCRETE ADHESIVE ANCHORS SHALL BE: HILTI RE 500-SD ESR #2322
- SPECIAL INSPECTION IN ACCORDANCE WITH SECTION 1704A OF THE CBC MUST BE PROVIDED FOR ALL ANCHOR INSTALLATIONS. THE SPECIAL INSPECTOR MUST BE ON THE JOBSITE DURING ANCHOR INSTALLATION TO VERIFY ANCHOR TYPE, ANCHOR DIMENSIONS, CONCRETE TYPE, CONCRETE COMPRESSIVE STRENGTH, HOLE DIMENSIONS, HOLE CLEANING PROCEDURES, ANCHOR SPACING, EDGE DISTANCES, CONCRETE THICKNESS, ANCHOR EMBEDMENT, AND TIGHTENING TORQUE. THE SPECIAL INSPECTOR MUST VERIFY THE INSTALLATIONS OF EACH TYPE AND SIZE OF ANCHOR BY CONSTRUCTION PERSONNEL ON SITE.
- DRILLED IN ADHESIVE ANCHORS AND THREADED RODS SHALL BE STAINLESS STEEL.

CONTRACTOR REQUIREMENTS CITY OF SAN DIEGO

THE CONTRACTOR OBTAINING THE BUILDING PERMIT SHALL PROVIDE THE CITY WITH A WRITTEN STATEMENT OF HIS RESPONSIBILITY FOR SPECIAL INSPECTION. THIS STATEMENT SHALL ACKNOWLEDGE SPECIAL INSPECTION REQUIREMENTS, ACKNOWLEDGE THAT CONTROL WILL BE EXERCISED TO OBTAIN COMPLIANCE WITH THE REQUIREMENTS OF THE SPECIAL INSPECTION NOTES, STATE PROCEDURES FOR EXERCISING CONTROL WITHIN THE CONTRACTOR'S ORGANIZATION INCLUDING METHOD AND FREQUENCY OF REPORTING AND DISTRIBUTION OF REPORTS. THE STATEMENT SHALL ALSO IDENTIFY THE INDIVIDUAL OR THE PERSON(S) RESPONSIBLE IN EXERCISING CONTROL AND THEIR POSITION IN THE CONTRACTOR'S ORGANIZATION. THIS SHALL BE SUBMITTED PRIOR TO THE START OF WORK.

12. STRUCTURAL STEEL SURFACES SHALL BE HOT DIPPED GALVANIZED AND COATED PER SPECIFICATION 0994C. COATING SHALL BE SYSTEM AT PER PART 3-8 FOR GALVANIZED SURFACES.

R-33

PLANS FOR THE CONSTRUCTION OF
METROPOLITAN BIOSOLIDS CENTER
CHEMICAL SYSTEMS IMPROVEMENTS PHASE II
STRUCTURAL GENERAL NOTES-I

CITY OF SAN DIEGO, CALIFORNIA
PUBLIC WORKS DEPARTMENT
SHEET 6 OF 10 SHEETS

DATE	11/26/14	FOR	FOR CHIEF ENGINEER	DATE	11/26/14
BY	3609	BY	FOR CHIEF ENGINEER	DATE	11/26/14
BY	3609	BY	FOR CHIEF ENGINEER	DATE	11/26/14
BY	3609	BY	FOR CHIEF ENGINEER	DATE	11/26/14
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BY	3609	BY	FOR CHIEF ENGINEER	DATE	11/26/14
BY	3609	BY	FOR CHIEF ENGINEER	DATE	11/26/14

CONTRACTOR: DATE STARTED: 3/25/2014
INSPECTOR: DATE COMPLETED: 3/25/2014

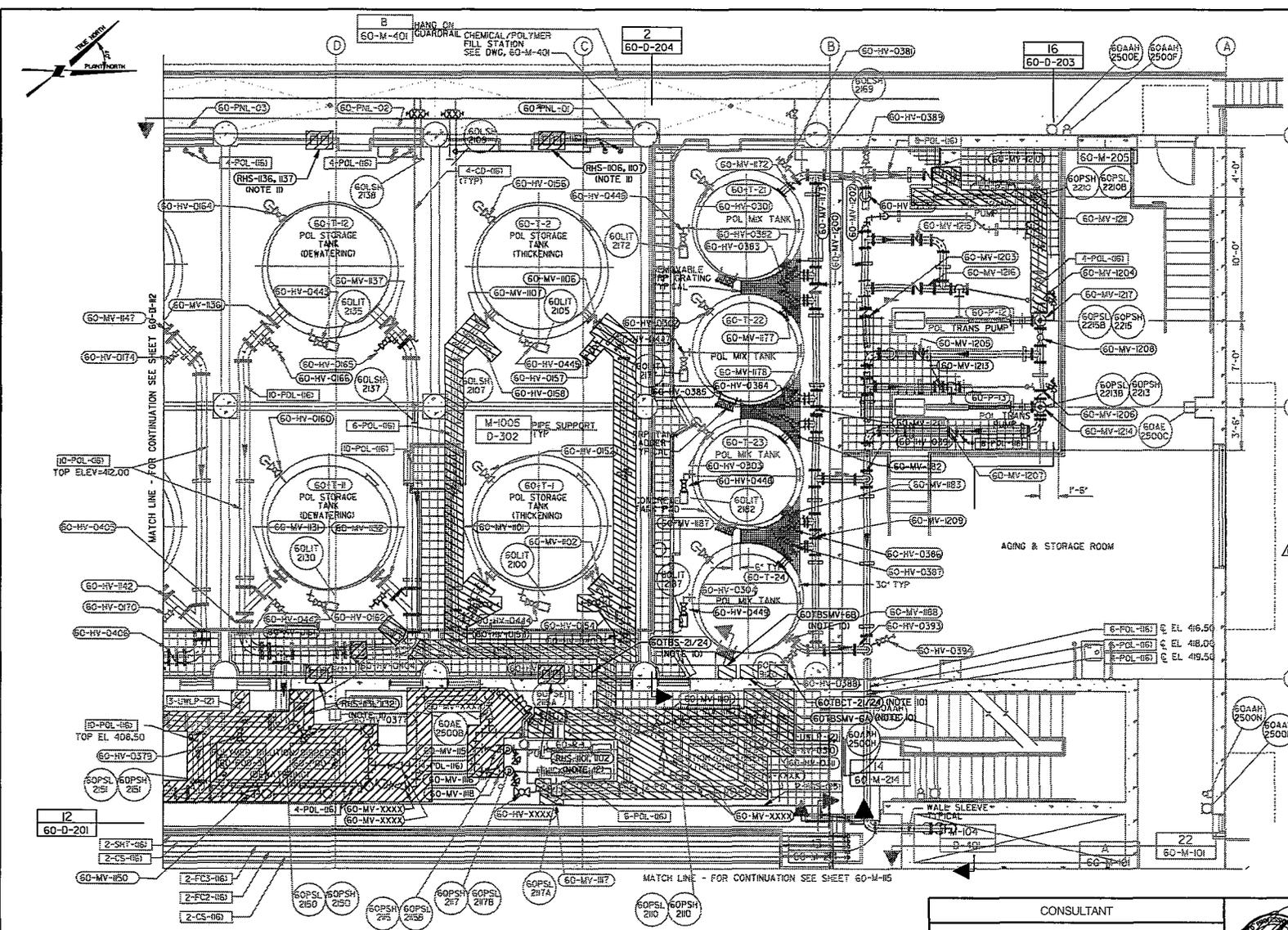
97240 6-D

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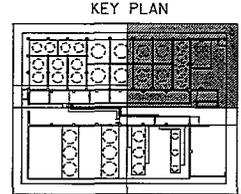
MARTIN & LIBBY
STRUCTURAL ENGINEERS
4457 Gleaser Avenue, San Diego, CA 92120
Ph (619) 784-9301 F (619) 784-3533
JOB NO 6772



METROPOLITAN BIOSOLIDS CENTER CHEMICAL SYSTEMS IMPROVEMENTS PHASE II



- NOTES:**
- SEE 60-D-2 FOR POLYMER THICKENING SYSTEM PFD DEMO DETAILS.
 - SEE 60-D-3 FOR POLYMER DEWATERING SYSTEM PFD DEMO DETAILS.
 - SEE 60-D-4 FOR COMBINED POLYMER SYSTEM PFD DEMO DETAILS.
 - DEMOLITION WORK SHALL NOT BE PERFORMED UNTIL APPROVAL OF THE CONTRACTOR'S CONSTRUCTION SEQUENCING PLANS PER SPECIFICATION 0180 IS GRANTED BY THE ENGINEER. ALL DEMOLITION WORK SHALL BE COORDINATED AND SCHEDULED WITH THE ENGINEER AND PLANT PERSONNEL AND SHALL BE PERFORMED IN A MANNER THAT ALLOWS THE PLANT TO REMAIN IN CONTINUOUS UNINTERRUPTED OPERATION. BRIEF INTERRUPTION MAY BE GRANTED TO A SYSTEM PENDING ENGINEER APPROVAL. WORK SHALL BE DONE IN ACCORDANCE WITH SPECIFICATION 0180.
 - LOCATION OF PIPING, VALVES, EQUIPMENT AND APPURTENANCES ARE SHOWN IN THEIR GENERAL LOCATION ON DEMOLITION PLANS AND SECTIONS. LIMITS OF REMOVAL SHOWN ON DRAWINGS INDICATE GENERAL EXTENTS OF DEMOLITION. START/STOP LOCATIONS, DEVIATIONS OF LIMITS OF DEMOLITION MAY BE REQUIRED BASED ON FIELD CONDITIONS UNENCOUNTERED AND IDENTIFICATION OF ANY POTENTIAL CONFLICTS WITH EXISTING FACILITIES. CONTRACTOR SHALL VERIFY AND OBTAIN APPROVAL BY THE ENGINEER ON ANY DEVIATIONS OF DEMOLITION LIMITS PRIOR TO PERFORMING THE WORK.
 - CONTRACTOR TO PROTECT ALL EXISTING FACILITIES THAT ARE NOT TO BE DEMOLISHED AND REPAIR/REPLACE ANY DAMAGES IN-KIND AS APPROVED BY ENGINEER.
 - ALL REMOVED ACTUATORS SHALL BE SALVAGED AND RETURNED BACK TO THE CITY.
 - SEE PLUMBING DRAWING 60-P-12 FOR CONTAINMENT WALL PENETRATION DETAILS.
 - CONTRACTOR SHALL COORDINATE AND FIELD VERIFY NEW PIPE WALL PENETRATION CORES, SIZE, ELEVATION AND EXACT LOCATION PER MECHANICAL DRAWINGS SECTION/DETAILS AND EXISTING FIELD CONDITIONS.
 - CONTRACTOR SHALL DEMO EXISTING PANEL AND REROUTE NEW CABLE AND CONDUIT FROM EXISTING ASSOCIATED INSTRUMENTS TO A NEW RELOCATED PANEL AS SHOWN ON THE ELECTRICAL DRAWINGS.
 - CONTRACTOR TO REMOVE REMOTE HAND STATIONS AND CONDUIT PER ELEC DWG REQUIREMENTS.
 - CONTRACTOR SHALL REMOVE EXISTING COATING FROM ALL CONTAINMENT BASINS WITHIN THE CHEMICAL TANK FARM, INCLUDING ALL WALLS, FLOOR AND CEILING. INSTALL NEW COATING AND SEALANTS PER SPEC 0980.
 - CONTRACTOR SHALL REMOVE EXISTING COATING FROM ALL INTERIOR BUILDING PERM CONTAINMENT BASINS WHERE WORK IS BEING PERFORMED INCLUDING ALL WALLS, FLOOR AND CEILING REGION AND INSTALL NEW COATING AND SEALANTS PER SPEC 0980.
 - SEE ELECTRICAL DRAWINGS FOR ADDITIONAL DEMO REQUIREMENTS.



AREA 60 PLAN
1/4" = 1'-0"

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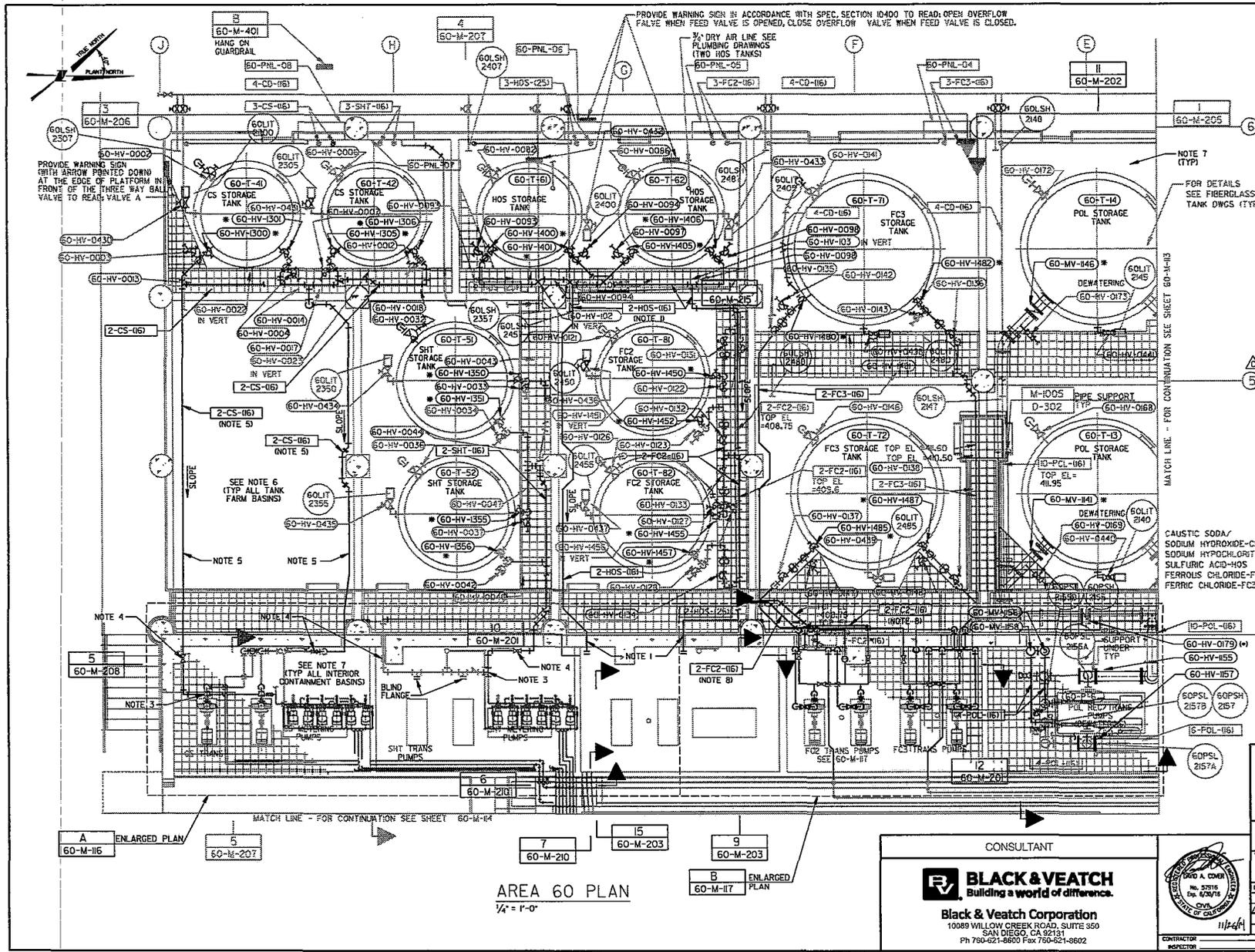
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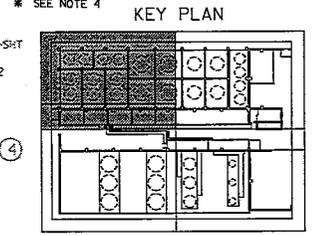


**PLANS FOR THE CONSTRUCTION OF
METROPOLITAN BIOSOLIDS CENTER
CHEMICAL SYSTEMS IMPROVEMENTS PHASE II
CHEMICAL BLDG GROUND FLOOR
PLAN - 2 DEMOLITION**

CITY OF SAN DIEGO, CALIFORNIA PUBLIC WORKS DEPARTMENT SHEET 22 OF 110 SHEETS		DATE: 11/26/14		WATER RES: BIO178	
PROJECT MANAGER: Joseph M. de Rosa		DATE FILMED: 6/7/16		PROJECT ENGINEER: Joseph A. Loryndo	
DESIGNER: J. J. AZORIN	BY: J. J. AZORIN	APPROVED: J. J. AZORIN	DATE: 11/26/14	246-1719	
DESCRIPTION: DEMOLITION	BY: J. J. AZORIN	APPROVED: J. J. AZORIN	DATE: 11/26/14	1886-6279	
CONTRACTOR: 11/24/14				DATE STARTED: 3/24/15	
CONTRACTOR INSPECTOR:				DATE COMPLETED: 3/24/15	

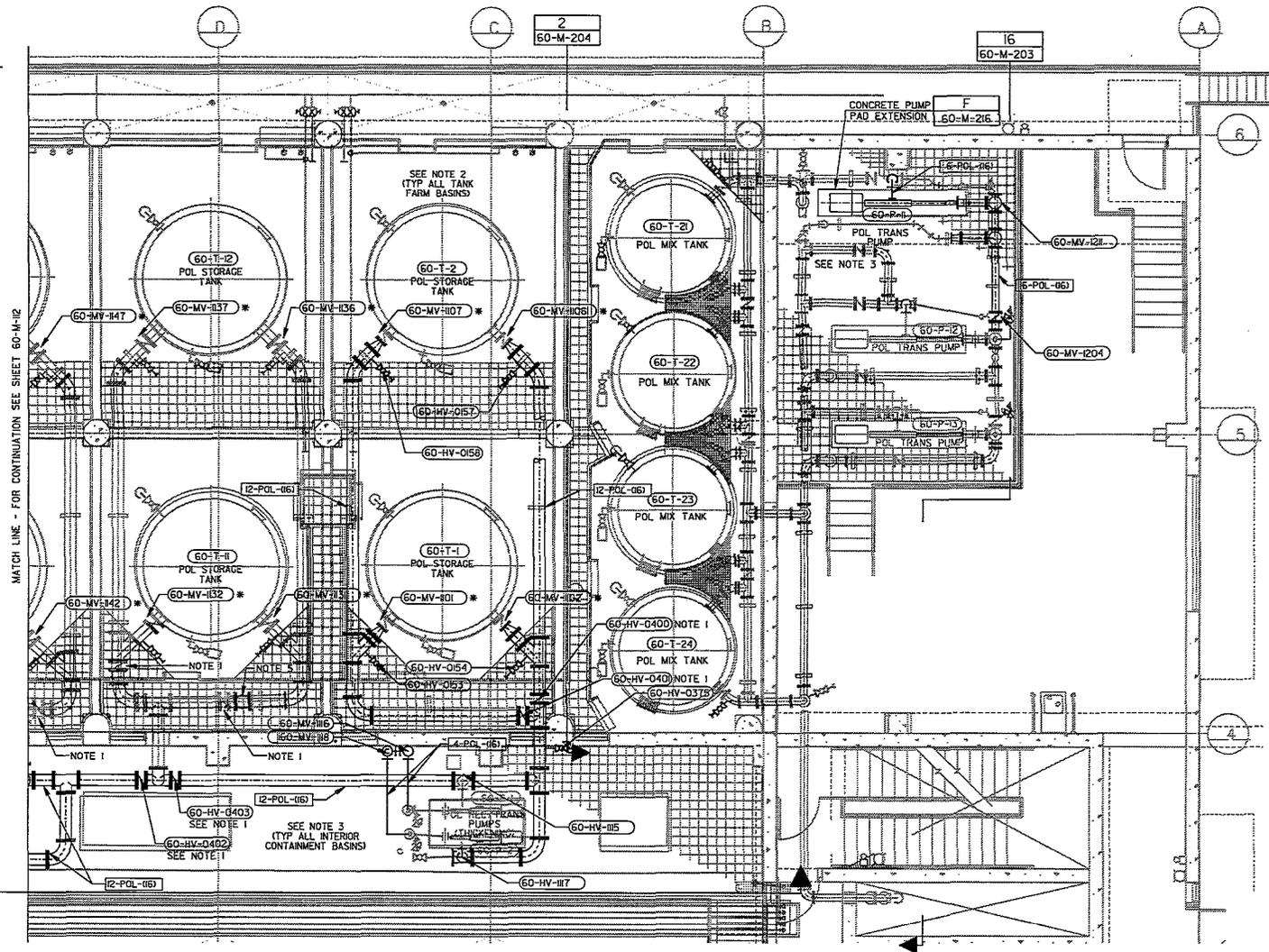
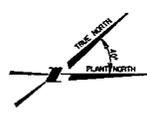


- NOTES:**
1. SYSTEM PIPING RUNNING THROUGH FERROUS CHLORIDE CONTAINMENT TANK SHALL BE DOUBLE WALL CONTAINED PIPING. DOUBLE WALL PIPE SHALL START WITHIN THE HOS TANKS BASIN AND TERMINATE IN THE SYSTEM'S PUMP CONTAINMENT AREA.
 2. ALL EXISTING WALL PENETRATIONS NOT BEING UTILIZED SHALL BE SEALED WITH NON-SHRINK GROUT.
 3. CONTRACTOR SHALL CONNECT NEW FEED LINE TO THE EXISTING PUMP SUCTION LINE ACCORDINGLY.
 4. CONTRACTOR SHALL PROVIDE AND INSTALL MANUAL VALVE OPERATOR EXTENSION AND SUPPORT SYSTEM FOR EXISTING BUTTERFLY VALVE. MANUFACTURER SUPPLIED EXTENSION IS PREFERRED. FABRICATED EXTENSION MAY BE USED AS AN ALTERNATE. EXTENSION AND SUPPORT SYSTEM PROPOSED SHALL BE SUBMITTED FOR REVIEW AND APPROVAL. EXTENSION SHALL EXTEND TO THE TOP OF HANDRAIL (+/- 4 TO 5 FEET TO ALLOW MAINTENANCE STAFF TO OPERATE FROM THE PLATFORM.
 5. CS PIPING WITHIN THE EMPTY CONTAINMENT BASIN SHALL BE DOUBLE WALL CONTAINED PIPING. DOUBLE WALL PIPING SHALL START WITHIN CS TANK BASIN AND TERMINATE IN THE CS PUMP CONTAINMENT AREA.
 6. CONTRACTOR SHALL REMOVE EXISTING COATING FROM ALL INTERIOR BUILDING PUMP CONTAINMENT BASINS WHERE WORK IS BEING PERFORMED INCLUDING ALL WALLS, FLOOR AND CEILING AND INSTALL NEW COATING AND SEALANTS PER SPEC 0980.
 7. CONTRACTOR SHALL REPAIR AND RECOAT ALL DAMAGED AREAS OF EXISTING COATINGS WITHIN ALL INTERIOR BUILDING CONTAINMENT BASINS WHERE WORK IS PERFORMED. REPAIR AND RECOATING PER SPEC 0980.
 8. SYSTEM PIPING RUNNING THROUGH FERROUS CHLORIDE CONTAINMENT TANK SHALL BE DOUBLE WALL CONTAINED PIPING. DOUBLE WALL PIPE SHALL START PRIOR TO PIPE WALL PENETRATION TO FERROUS CHLORIDE CONTAINMENT CELL AND END IN THE SYSTEM'S PUMP CONTAINMENT AREA.
 9. CONTRACTOR SHALL ROUTE NEW AND RELOCATE EXISTING PIPE AND FITTINGS AS NEEDED TO AVOID CONFLICTS WITH NEW TANK CATWALK GRATING SYSTEM.
- * SEE NOTE 4



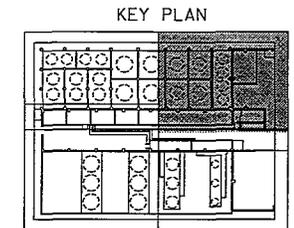
PLANS FOR THE CONSTRUCTION OF METROPOLITAN BIOSOLIDS CENTER CHEMICAL SYSTEMS IMPROVEMENTS PHASE II CHEMICAL BLDG FLOOR PLAN - I REVISED PIPING

CITY OF SAN DIEGO, CALIFORNIA		WATER	
PUBLIC WORKS DEPARTMENT		SEWER	
SHEET 66 OF 170 SHEETS		SIS	
		BI0178	
FOR CITY ENGINEER	DATE	11/16/14	
WILLIAMSON	BY	3009	
DESIGNER	DATE	11/16/14	
BY	DATE	11/16/14	
APPROVED	DATE	11/16/14	
DATE	DATE	11/16/14	



MATCH LINE - FOR CONTINUATION SEE SHEET 60-M-12

- NOTES:**
- CONTRACTOR SHALL PROVIDE AND INSTALL MANUAL OPERATOR EXTENSION FROM ALL NEW AND EXISTING VALVES TO THE FRP GRATING LEVEL. OPERATOR EXTENSION SHALL INCLUDE A 2-INCH OPERATOR NUT PLACED AT THE FRP GRATING LEVEL. INSTALL ALL EXTENSION GUIDES AND SUPPORTS AS NECESSARY FOR EACH VALVE. FOR OPERATOR EXTENSIONS DIRECTLY BELOW FRP GRATING A HOLE SHALL BE CUT INTO THE GRATING LARGE ENOUGH TO PROVIDE CONNECTION TO THE NUT WITH A VALVE NUT WRENCH.
 - CONTRACTOR SHALL REMOVE EXISTING COATING FROM ALL CONTAINMENT BASINS WITHIN THE CHEMICAL TANK FARM, INCLUDING ALL WALLS, FLOOR AND SUMP REGION. INSTALL NEW COATING AND SEALANTS PER SPEC 0980.
 - CONTRACTOR SHALL REMOVE EXISTING COATING FROM ALL INTERIOR BUILDING PUMP CONTAINMENT BASINS WHERE WORK IS BEING PERFORMED INCLUDING ALL WALLS, FLOOR AND SUMP REGION AND INSTALL NEW COATING AND SEALANTS PER SPEC 0980.
 - CONTRACTOR SHALL PROVIDE AND INSTALL MANUAL VALVE OPERATOR EXTENSION AND SUPPORT SYSTEM FOR EXISTING BUTTERFLY VALVE. MANUFACTURER SUPPLIED IS PREFERRED. FABRICATED EXTENSION MAY BE USED AS AN ALTERNATIVE. EXTENSION AND SUPPORT SYSTEM PROPOSED SHALL BE SUBMITTED FOR REVIEW AND APPROVAL. EXTENSION SHALL EXTEND TO THE TOP OF HANDRAIL +/- 4 TO 5 FEET TO ALLOW MAINTENANCE STAFF TO OPERATE FROM THE PLATFORM.
 - INSTALL NEW SPOOL AFTER REMOVAL OF PIPE AND VALVE. SEE 60-D-3.
 - CONTRACTOR SHALL ROUTE NEW AND RELOCATE EXISTING PIPE AND FITTINGS AS NEEDED TO AVOID CONFLICTS WITH NEW TANK CATWALK GRATING SYSTEM.
- SEE NOTE 4



AREA 60 PLAN
1/4" = 1'-0"

12
60-M-201

60-M-113A

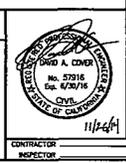
**PLANS FOR THE CONSTRUCTION OF
METROPOLITAN BIOSOLIDS CENTER
CHEMICAL SYSTEMS IMPROVEMENTS PHASE II
CHEMICAL BLDG FLOOR PLAN - 2
REVISED PIPING**

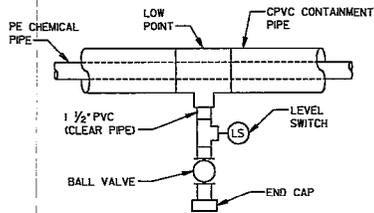
CITY OF SAN DIEGO, CALIFORNIA PUBLIC WORKS DEPARTMENT SHEET 67 OF 170 SHEETS		WATER NO. B10178 SEWER NO. B10178
DESIGNED BY DANIEL ASSUMAZZI	DATE 11/26/14	PROJECT MANAGER MICHAEL M. CO. RESSO
DESCRIPTION BY	APPROVED DATE	PROJECT ENGINEER JACOB A. LORRY
ORIGINAL BY	DATE 5/27/15	NO. 246-1719
ADDENDUM C BY	DATE 11/24/15	ISSUE COORDINATOR 1886-6279
CONTRACTOR INSPECTOR	DATE STARTED DATE COMPLETED	ISSUE TRACKING 37240-67-D

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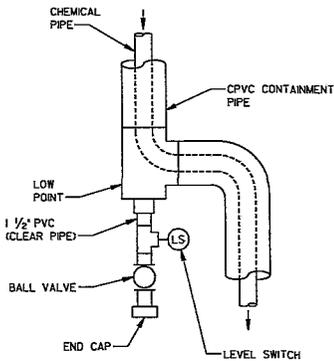
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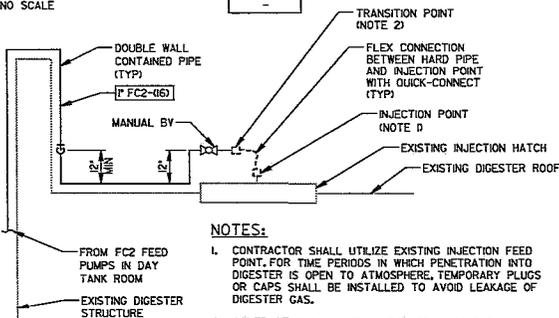


HORIZONTAL PIPE CONFIGURATION



VERTICAL PIPE CONFIGURATION

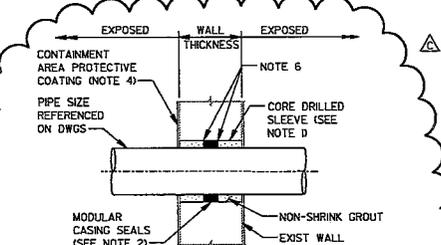
LEAK DETECTION DETAIL A
NO SCALE



NOTES:

- CONTRACTOR SHALL UTILIZE EXISTING INJECTION FEED POINT. FOR TIME PERIODS IN WHICH PENETRATION INTO DIGESTER IS OPEN TO ATMOSPHERE, TEMPORARY PLUGS OR CAPS SHALL BE INSTALLED TO AVOID LEAKAGE OF DIGESTER GAS.
- CONTRACTOR SHALL TRANSITION FROM DOUBLE WALL TO SINGLE WALL PIPE DOWNSTREAM OF THIS POINT.
- CONTRACTOR SHALL FIELD ROUTE PIPE ACCORDINGLY PER FIELD DIMENSION AND ELEVATION VERIFICATION.

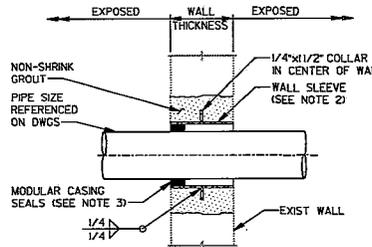
FERROUS CHLORIDE DIGESTER INJECTION DETAIL E
NO SCALE



NOTES:

- CORE DRILL SMOOTH WALL OPENING. COORDINATE CORE DIAMETER AS REQUIRED WITH CASING SEAL MANUFACTURER. MAXIMUM CORE DIAMETER SHALL BE 12".
- WHEN SOIL MAY BE PRESENT, USE TWO SETS OF CASING SEALS, ONE AT EACH FACE OF WALL.
- FRESASFACING TO BE PROVIDED AT ALL RATED WALLS INDICATED ON THE DRAWINGS AND INSTALLED PER ACCEPTED UL RATED SYSTEM. SEE DRAWING R-2 PROJECT DATA TABLE STRUCTURAL FIRE RESISTANCE REQUIREMENTS. ALL PENETRATIONS SHALL BE FIRE RATED TO MATCH EXISTING RATING OF THE STRUCTURAL MEMBER BEING PENETRATED.
- IF PIPE WALL PENETRATION IS LOCATED IN A CHEMICAL CONTAINMENT AREA, PROTECTIVE COATING SHALL BE APPLIED PER SPECIFICATION SECTION 09880 ACCORDINGLY.
- CONTRACTOR SHALL DETERMINE THE LOCATION OF EXISTING REINFORCEMENT PRIOR TO INSTALLATION OF ANY CORES. IDENTIFICATION SHALL BE PER NON-DESTRUCTIVE METHODS WHICH MAY INCLUDE X-RAY OR OTHER METHODS APPROVED BY THE ENGINEER.
- ISOLATION BETWEEN MODULAR CASING SEALS AND NON-SHRINK GROUT SHALL BE PROVIDED PER MODULAR CASING SEAL MANUFACTURER RECOMMENDATION.

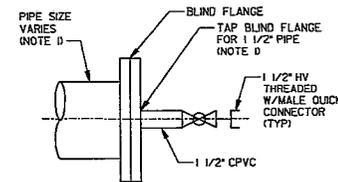
CORE DRILLED WALL SLEEVE B
NO SCALE



NOTES:

- CUT OPENING FOR WALL SLEEVE, ROUGHEN EXIST CONCRETE, APPLY BONDING AGENT AND FILL WITH NON-SHRINK GROUT PER THE SPECIFICATIONS. DIAMETER OF OPENING TO BE COLLAR DIAMETER + 4".
- WALL SLEEVE, SCHEDULE 40 STEEL PIPE FOR 12" AND SMALLER SLEEVES, 1/4" STEEL PIPE FOR SLEEVES LARGER THAN 12", AND HOT DIP GALVANIZED AFTER FABRICATION, 304 SS, OR OTHER MATERIAL AS SPECIFIED OR INDICATED ON DRAWINGS. COORDINATE SLEEVE SIZE WITH MODULAR CASING SEAL MANUFACTURER.
- WHERE SOIL MAY BE PRESENT, USE TWO SETS OF CASING SEALS, ONE AT EACH FACE OF WALL.
- FRESASFACING TO BE PROVIDED AT ALL RATED WALLS INDICATED ON THE DRAWINGS AND INSTALLED PER ACCEPTED UL RATED SYSTEM.

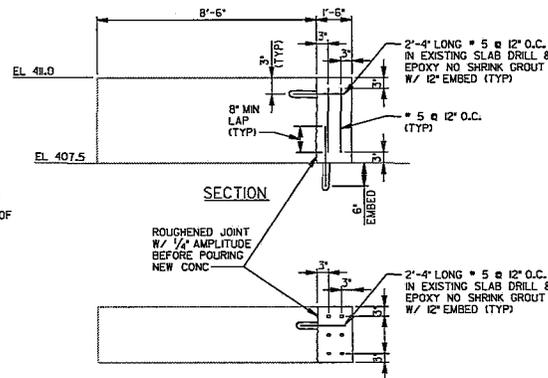
WALL SLEEVE AT EXISTING CONCRETE WALL C
NO SCALE



NOTE:

- FOR 6" AND LARGER, TAP SHALL BE PLACED AT INVERT OF BLIND FLANGE (NOT CENTERLINE).

FLUSHING CONNECTION D
NO SCALE



NOTES:

- CONTRACTOR SHALL FIELD VERIFY EXISTING PAD DIMENSIONS AND ELEVATION.
- PUMP 60-P-II CONCRETE PAD SHALL MATCH EXISTING PUMP 60-P-I2 CONCRETE PAD DIMENSIONS.

CONC PAD EXTENSION F
NO SCALE

60-M-216

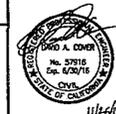
PLANS FOR THE CONSTRUCTION OF
METROPOLITAN BIOSOLIDS CENTER
CHEMICAL SYSTEMS IMPROVEMENTS PHASE II
MECHANICAL DETAILS

CITY OF SAN DIEGO, CALIFORNIA PUBLIC WORKS DEPARTMENT SHEET 79 OF 170 SHEETS		WATER WBS WBS BI0178	
FOR CITY ENGINEER	DATE	BY	SEALS
11/26/14			
DESIGNATION	BY	APPROVED	DATE
ADDITION C	BY		5/1/15
246-1719			1886-6279
1886-6279			37240-79 -D

CONSULTANT

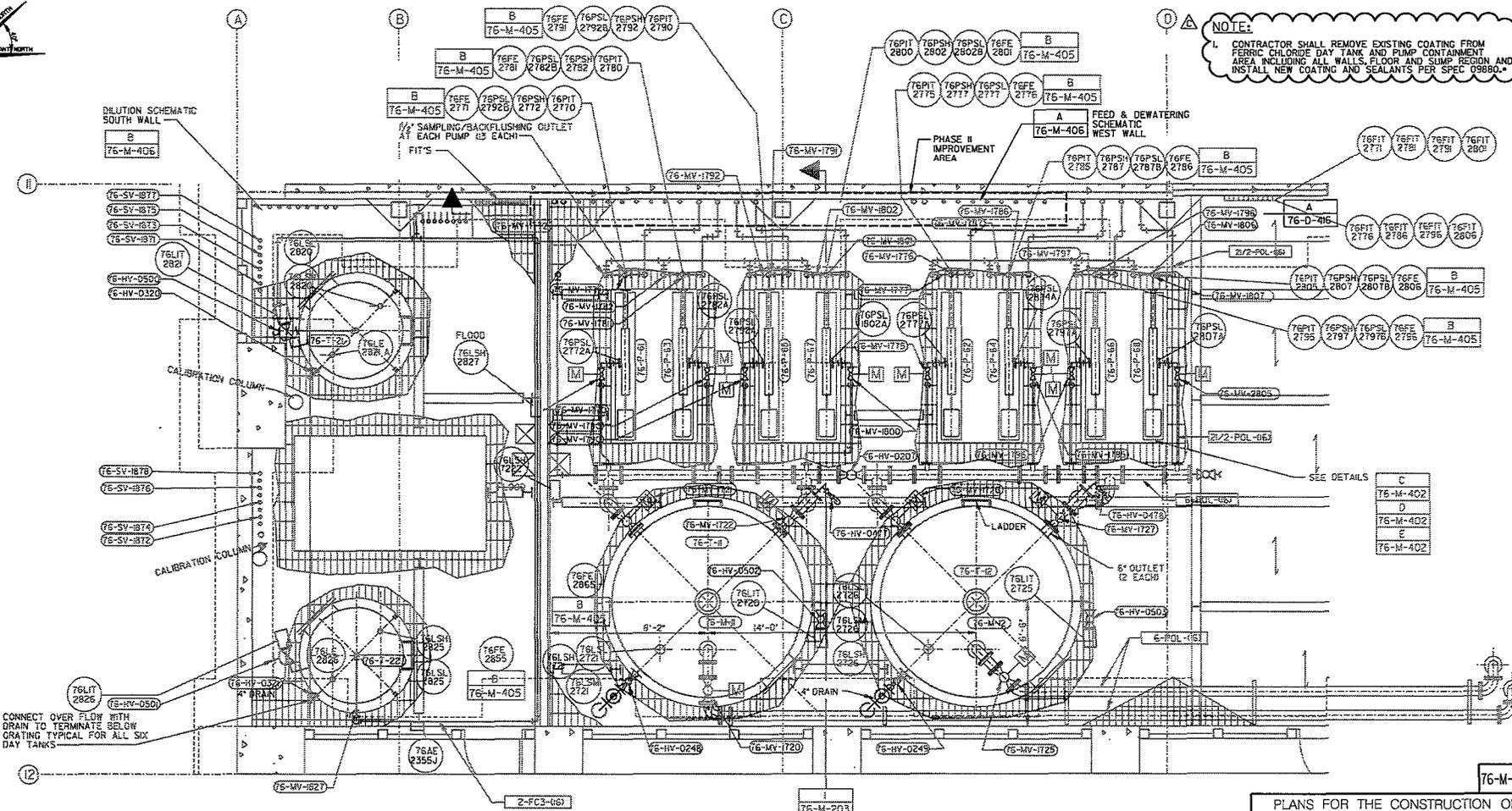
BLACK & VEATCH
Building a world of difference.

Black & Veatch Corporation
10089 WILLOW CREEK ROAD, SUITE 550
SAN DIEGO, CA 92131
PH 760-621-8600 FAX 760-621-8602



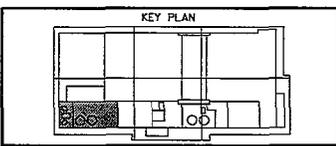
CONTRACTOR
REVISOR

DATE STARTED
DATE COMPLETED



NOTE:
 1. CONTRACTOR SHALL REMOVE EXISTING COATING FROM FERRIC CHLORIDE DAY TANK AND PUMP CONTAINMENT AREA INCLUDING ALL WALLS, FLOOR AND SUMP REGION AND INSTALL NEW COATING AND SEALANTS PER SPEC 0366A.

FERRIC CHLORIDE AND DEWATERING POLYMER PLAN
 3/8" = 1'-0"

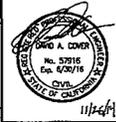


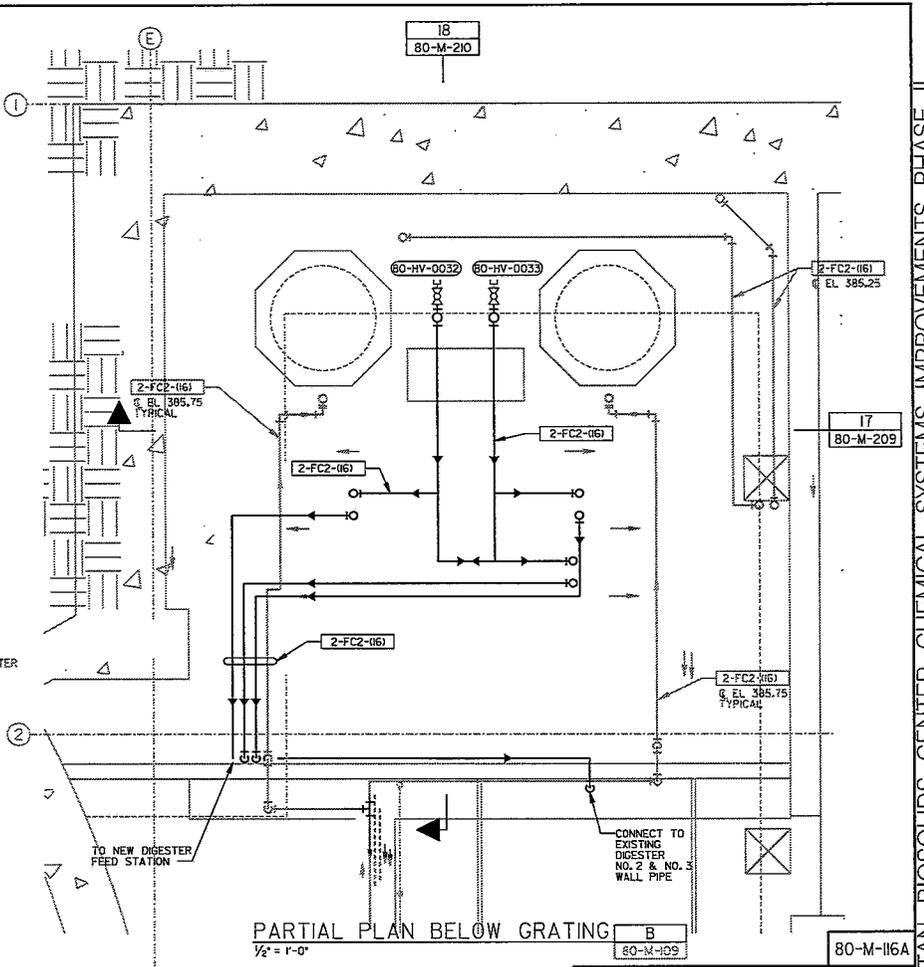
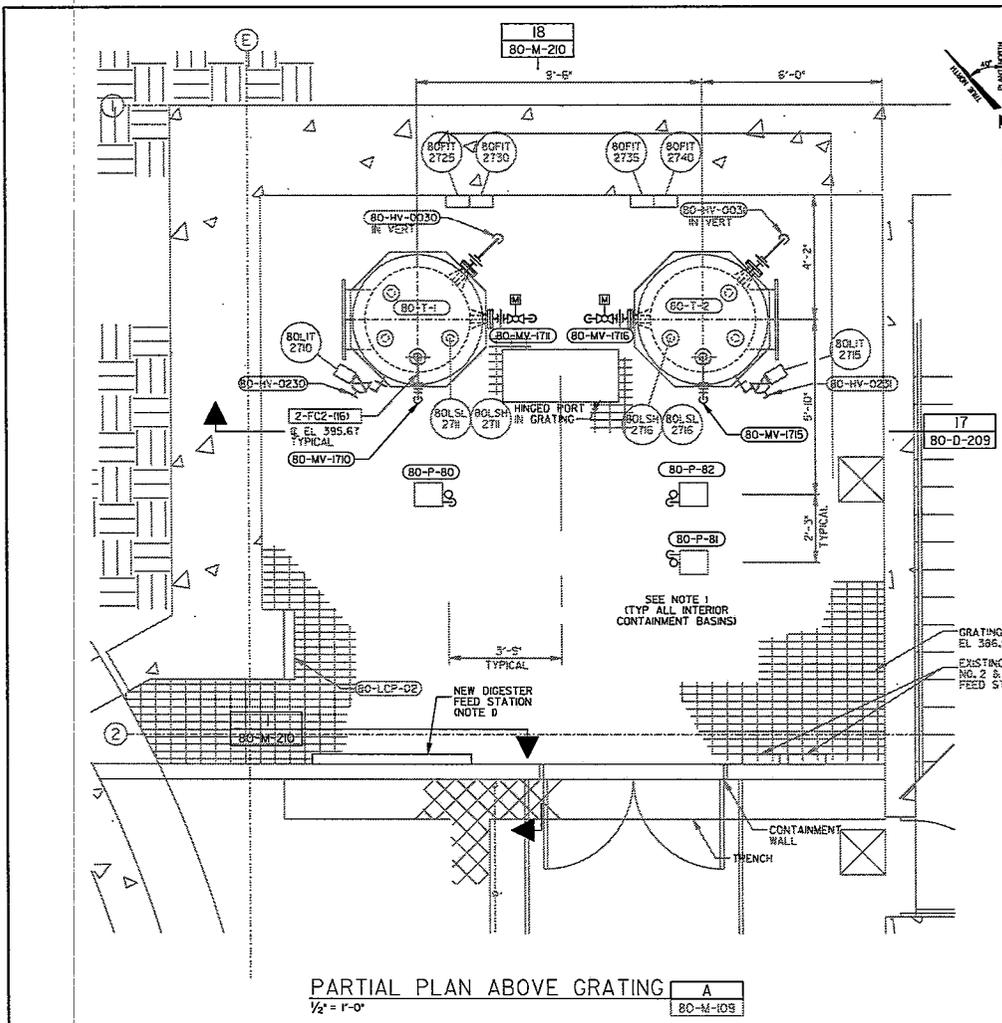
PLANS FOR THE CONSTRUCTION OF METROPOLITAN BIOSOLIDS CENTER CHEMICAL SYSTEMS IMPROVEMENTS PHASE II FERRIC CHLORIDE AND DEWATERING POLYMER PLAN REVISED PIPING				WATER MS SEWER RFS	BOLT8
CITY OF SAN DIEGO, CALIFORNIA PUBLIC WORKS DEPARTMENT SHEET 83 OF 170 SHEETS				DATE 11/16/11	PROJECT MANAGER Scott M. Rice
DESIGNER DAVID A. COVER No. 02915 San. & Water CIVIL STATE OF CALIFORNIA	BY J. L. [Signature]	DATE 3/1/11	APPROVED [Signature]	DATE 3/1/11	PROJECT ENGINEER Joseph A. Larriva
DESCRIPTION ORIGINAL	BY DAV	DATE 3/1/11	DATE 3/1/11	DATE 3/1/11	CHECK ENGINEER 1896-6279
CONTRACTOR INSPECTOR	DATE STARTED	DATE COMPLETED	37240-93-D		

CONSULTANT

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 Building a world of difference.

Black & Veatch Corporation
 10289 WILLOW CREEK ROAD, SUITE 350
 SAN DIEGO, CA 92131
 PH 760-621-9800 FAX 760-621-8602

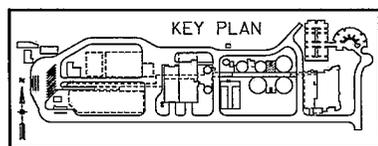




PARTIAL PLAN ABOVE GRATING A
1/2" = 1'-0"

PARTIAL PLAN BELOW GRATING B
1/2" = 1'-0"

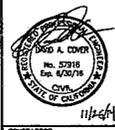
NOTE:
 1. CONTRACTOR SHALL REMOVE EXISTING COATING FROM FERROUS CHLORIDE DAY TANK AND PUMP ROOM INCLUDING ALL WALLS, FLOOR AND SLUMP REGION AND INSTALL NEW COATING AND SEALANTS PER SPEC 09880.
 2. CONTRACTOR SHALL REPLACE ANY UNUTILIZED GRATING OPENINGS WITH NEW GRATING MATCHING EXISTING GRATING.



CONSULTANT

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Building a world of difference.

Black & Veatch Corporation
10088 WILLOW CREEK ROAD, SUITE 350
SAN DIEGO, CA 92131
Ph 760-621-8600 Fax 760-621-8602



CITY OF SAN DIEGO, CALIFORNIA PUBLIC WORKS DEPARTMENT SHEET III OF 170 SHEETS		WATER #88 #89 #90 #91 #92 #93 #94 #95 #96 #97 #98 #99 #100
FOR CITY ENGINEER RALPH ANDERSON DATE 11/26/11 TIME 11:26 AM		PROJECT MANAGER Jorge A. Larriva PROJECT ENGINEER 245-1178 COST CODE 1896-5279 CROSS CHECKED BY 37240-111-D
DESCRIPTION BY CHECKED APPROVED DATE FILED	11/26/11 11/26/11 11/26/11 11/26/11	DATE STARTED DATE COMPLETED

DIR ✓
License ✓
MC

City of San Diego

CONTRACTOR'S NAME: Stanek Constructors, Inc.
ADDRESS: 2434 Auto Park Way, Ste. 102, Escondido, CA 92029
TELEPHONE NO.: 760-871-0102 FAX NO.: 760-871-0100
CITY CONTACT: Eleida Felix Yackel - Contract Specialist, Email: EFelixYackel@sandiego.gov
Phone No. (619) 533-3449, Fax No. (619) 533-3633
I.M.DaRosa/RWBustamante/Lad

CONTRACT DOCUMENTS



FOR

MBC - Chemical System Improvements - Phase II

VOLUME 2 OF 2

BID NO.: K-15-6231-DBB-3
SAP NO. (WBS/IO/CC): B-10178
CLIENT DEPARTMENT: 2011
COUNCIL DISTRICT: 7
PROJECT TYPE: BO

THIS CONTRACT IS SUBJECT TO THE FOLLOWING:

- PHASED-FUNDING
- THE CITY'S SUBCONTRACTING PARTICIPATION REQUIREMENTS FOR SLBE PROGRAM.
- PREVAILING WAGE RATES: STATE FEDERAL .
- APPRENTICESHIP.
- THIS IS A CWSRF FUNDED CONTRACT THROUGH THE STATE OF CALIFORNIA.

THIS BIDDING DOCUMENT TO BE SUBMITTED IN ITS ENTIRETY REFER TO VOLUME 1 COVER PAGE FOR TIME, DATE, AND LOCATION

TABLE OF CONTENTS

DESCRIPTION

PAGE NUMBER

Volume 2 - Bidding Documents

The following forms must be completed in their entirety and submitted with the Bid. Include the form(s) even if the information does not apply. Where the information does not apply write in N/A. Failure to include any of the forms may cause the Bid to be deemed **non-responsive**. If you are uncertain or have any questions about any required information, contact the City no later than 14 days prior to Bid due date.

1. Bid/Proposal.....	3
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3. Non-Collusion Affidavit to be executed by Bidder and Submitted with Bid under 23 USC 112 and PCC 7106	7
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12. EPA FORM 6100-3 – DBE Subcontractor Performance Form	20
13. EPA FORM 6100-4 – DBE Subcontractor Utilization Form	22

BIDDING DOCUMENTS

PROPOSAL

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.

IF A SOLE OWNER OR SOLE CONTRACTOR SIGN HERE: **N/A**

- (1) Name under which business is conducted _____
- (2) Signature (Given and surname) of proprietor _____
- (3) Place of Business (Street & Number) _____
- (4) City and State _____ Zip Code _____
- (5) Telephone No. _____ Facsimile No. _____
- (6) Email Address _____

BIDDING DOCUMENTS

IF A PARTNERSHIP, SIGN HERE: N/A

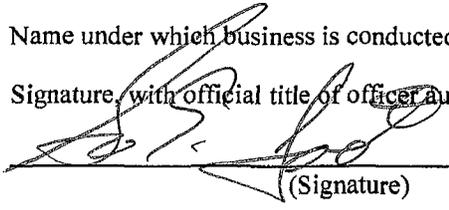
- (1) Name under which business is conducted _____
- (2) Name of each member of partnership, indicate character of each partner, general or special (limited):

- (3) Signature (Note: Signature must be made by a general partner)

Full Name and Character of partner

- (4) Place of Business (Street & Number) _____
- (5) City and State _____ Zip Code _____
- (6) Telephone No. _____ Facsimile No. _____
- (7) Email Address _____

IF A CORPORATION, SIGN HERE:

- (1) Name under which business is conducted **Stanek Constructors, Inc.** _____
- (2) Signature, with official title of officer authorized to sign for the corporation:


(Signature)

George E. Foote _____
(Printed Name)

Vice President _____
(Title of Officer)

(Impress Corporate Seal Here)
- (3) Incorporated under the laws of the State of **Colorado** _____
- (4) Place of Business (Street & Number) **2434 Auto Park Way, Ste. 102** _____

BIDDING DOCUMENTS

(5) City and State **Escondido, CA** Zip Code **92029**
(6) Telephone No. **760-871-0102** Facsimile No. **760-871-0100**
(7) Email Address **gfoote@stanekconstructors.com**

THE FOLLOWING SECTIONS MUST BE FILLED IN BY ALL PROPOSERS:

In accordance with the "NOTICE INVITING BIDS", the bidder holds a California State Contractor's license for the following classification(s) to perform the work described in these specifications:

LICENSE CLASSIFICATION **A**

LICENSE NO. **869424** EXPIRES **December 31, 2015**

DEPARTMENT OF INDUSTRIAL RELATIONS (DIR) REGISTRATION NUMBER: **1000000499**

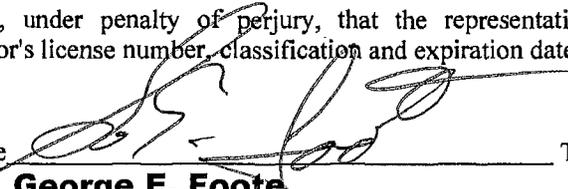
This license classification must also be shown on the front of the bid envelope. Failure to show license classification on the bid envelope may cause return of the bid unopened.

TAX IDENTIFICATION NUMBER (TIN): XXXXXXXXXX

Email Address: **gfoote@stanekconstructors.com**

THIS PROPOSAL MUST BE NOTARIZED BELOW:

I certify, under penalty of perjury, that the representations made herein regarding my State Contractor's license number, classification and expiration date are true and correct.

Signature  Title **Vice President**
George E. Foote

SUBSCRIBED AND SWORN TO BEFORE ME, THIS _____ DAY OF _____.

Notary Public in and for the County of _____, State of _____

(NOTARIAL SEAL)

See Attached.

California Acknowledgment Form

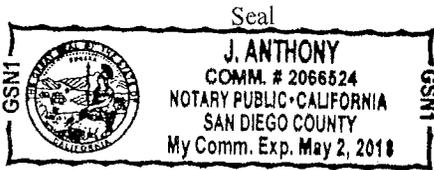
A notary public or other officer completing this certificate verifies only the identity of the individual who signed the document to which this certificate is attached, and not the truthfulness, accuracy, or validity of that document.

State of California }
County of San Diego } ss.

On June 9, 2015 before me, J. Anthony, Notary Public,
(here insert name and title of the officer)
personally appeared George E. Foote

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 of Notary

Optional Information

To help prevent fraud, it is recommended that you provide information about the attached document below.
This is not required under California State notary public law.

Document Title: Bidding Docs # of Pages: N/A

Notes

BIDDING DOCUMENTS

BID BOND

KNOW ALL MEN BY THESE PRESENTS,

That Stanek Constructors, Inc., 2434 Auto Park Way, Suite 102, Escondido, CA 92029 as Principal, and Berkley Insurance Company, 475 Steamboat Road, Greenwich, CT 06830 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

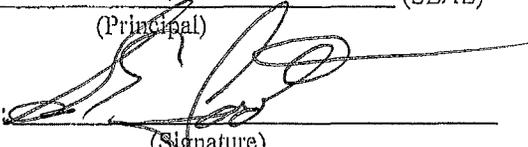
MBC - Chemical System Improvements - Phase II, San Diego, CA

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 9th day of June, 20 15

Stanek Constructors, Inc. (SEAL)

(Principal)

By: 

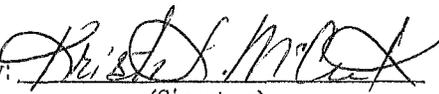
(Signature)

George E. Foote, Vice President

(SEAL AND NOTARIAL ACKNOWLEDGEMENT OF SURETY)

Berkley Insurance Company (SEAL)

(Surety)

By: 

(Signature)

Kristen L. McCormick, Attorney-In-Fact
CA License #0E46980

California Acknowledgment Form

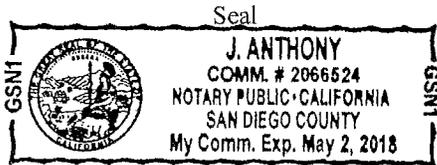
A notary public or other officer completing this certificate verifies only the identity of the individual who signed the document to which this certificate is attached, and not the truthfulness, accuracy, or validity of that document.

State of California }
County of San Diego } ss.

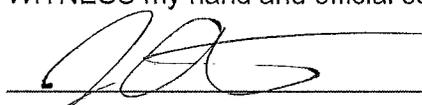
On June 9, 2015 before me, J. Anthony, Notary Public,
(here insert name and title of the officer)
personally appeared George E. Foote

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 of Notary

Optional Information

To help prevent fraud, it is recommended that you provide information about the attached document below.

This is not required under California State notary public law.

Document Title: Bid Bond # of Pages: N/A

Notes

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)
) ss.
County of _____)

George E. Foote _____, being first duly sworn, deposes and says that he or she is **Vice President** _____ of 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.

Signed:  _____

Title: **Vice President** _____

Subscribed and sworn to before me this _____ day of _____, 20____

Notary Public

(SEAL)
See attached

California Acknowledgment Form

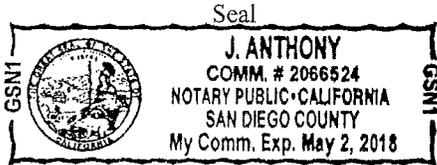
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State of California }
County of San Diego } ss.

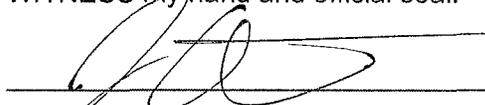
On June 9, 2015 before me, J. Anthony, Notary Public,
(here insert name and title of the officer)
personally appeared George E. Foote

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 of Notary

Optional Information

To help prevent fraud, it is recommended that you provide information about the attached document below.

This is not required under California State notary public law.

Document Title: Non Collusion Affidavit # of Pages: N/A

Notes

BIDDING DOCUMENTS

CONTRACTORS 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.

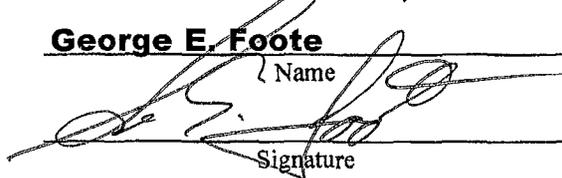
CHECK ONE BOX ONLY.

- 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:

Contractor Name: **Stanek Constructors, Inc.**

Certified By **George E. Foote** Title **Vice President**


Name
Signature

Date **June 9, 2015**

USE ADDITIONAL FORMS AS NECESSARY

BIDDING DOCUMENTS

**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
 Phone (619) 533-3948 Fax (619) 533-3220

COMPANY INFORMATION

Company Name: Stanek Constructors, Inc.	Contact Name: George E. Foote
Company Address: 2434 Auto Park Way, Ste. 102	Contact Phone: 760-871-0102
Escondido, CA 92029	Contact Email: gfoote@stanekconstructors.com

CONTRACT INFORMATION

Contract Title: MBC- Chemical System Improvements- Phase II	Start Date:
Contract Number (if no number, state location): K-15-6231-DBB-3	End Date:

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.

George E. Foote, Vice President		6-9-15
Name/Title of Signatory	Signature	Date

FOR OFFICIAL CITY USE ONLY

Receipt Date: _____ EBO Analyst: _____ Approved Not Approved – Reason: _____

(Rev 02/15/2011)

BIDDING DOCUMENTS

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.

BIDDING DOCUMENTS

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 (item 1). 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 (item 4) to the lobbying entity (item 10). 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.

According to the Paperwork Reduction Act, as amended, no persons are required to respond to a collection of information unless it displays a valid OMB Control Number. The valid OMB control number for this information collection is OMB No. 0348-0046. Public reporting burden for this collection of information is estimated to average 30 minutes per response, including time for reviewing instructions, searching existing datasources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding the burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to the Office of Management and Budget, Paperwork Reduction Project (0348-0046), Washington, DC 20503.

BIDDING DOCUMENTS

DISCLOSURE OF LOBBYING ACTIVITIES Approved by
CONTINUATION SHEET

OMB0348-0046

Reporting Entity: _____ Page _____ of _____

N/A

Authorized for Local Reproduction
Standard Form - LLL-A

BIDDING DOCUMENTS

PROPOSAL (BID)

The Bidder agrees to the construction of **MBC - Chemical System Improvements - Phase II** for the City of San Diego, in accordance with these contract documents for the prices listed below. 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 to Award of the Contract. 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 e.g., bond and insurance.

Item	Quantity	Unit	NAICS	Payment Reference	Description	Unit Price	Extension
1	1	LS	524126	2-4.1	Bonds (Payment and Performance)		\$ 20,000
2	1	LS	238120	9-3.8	Area 60 Tank Farm Structural Work		\$ 400,000
3	1	LS	238390	9-3.8	Containment Area Protective Coating Work (All Areas)		\$ 1,075,000 1,186,000 SEE
4	1	LS	237110	9-3.8	All Work Associated With Chemical System Improvements - Area 60 (Polymer Mixing)		\$ 675,000
5	1	LS	237110	9-3.8	All Work Associated with Chemical System Improvements - Area 60 (Polymer Bulk Storage)		\$ 488,000
6	1	LS	237110	9-3.8	All Work Associated with Chemical System Improvements - Area 60 (Ferric Chloride)		\$ 200,000
7	1	LS	237110	9-3.8	All Work Associated with Chemical System Improvements - Area 60 (Ferrous Chloride)		\$ 225,000
8	1	LS	237110	9-3.8	All Work Associated with Chemical System Improvements - Area 60 (Sulfuric Acid)		\$ 200,000
9	1	LS	237110	9-3.8	All Work Associated with Chemical System Improvements - Area 60 (Sodium Hypochlorite)		\$ 95,000
10	1	LS	237110	9-3.8	All Work Associated with Chemical System Improvements - Area 60 (Caustic Soda)		\$ 190,000

BIDDING DOCUMENTS

Item	Quantity	Unit	NAICS	Payment Reference	Description	Unit Price	Extension
11	1	LS	237110	9-3.8	All Work Associated with Chemical System Improvements - Area 76 (Ferric Chloride and Polymer)	 	\$ 100,000
12	1	LS	237110	9-3.8	All Work Associated with Chemical System Improvements - Area 80 (Ferrous Chloride)	 	\$ 225,000
13	1	AL	237110	7-5.3	Permits, Fees and Notices - Type I	 	\$ 10,000.00
14	1	LS	237110	9-3.4.1	Mobilization	 	\$ 100,000
15	1	AL		9-3.5	Field Orders - Type II	 	\$450,000.00
16	1	LS	541330	701-13.9.5	Water Pollution Control Program Development	 	\$ 1,000
17	1	LS	237310	701-13.9.5	Water Pollution Control Program Implementation	 	\$ 2,000
ESTIMATED TOTAL BASE BID:							\$ 4,567,000 MC

BIDDING DOCUMENTS

TOTAL BID PRICE FOR BID (Items 1 through 17 inclusive) amount written in words:

Four million Five hundred sixty seven thousand dollars

The Bid shall contain an acknowledgment of receipt of all addenda, the numbers of which shall be filled in on the Bid form. If an addendum or addenda has been issued by the City and not noted as being received by the Bidder, this proposal shall be rejected as being **non-responsive**. The following addenda have been received and are acknowledged in this bid: **A, B and C**

The names of all persons interested in the foregoing proposal as principals are as follows:

Robert S. Stanek, President

George E. Foote, Vice President

Jerry E. Arguello, Treasurer

Diane M. Stanek, Secretary

IMPORTANT NOTICE: If Bidder or other interested person is a corporation, state secretary, treasurer, and manager thereof; if a co-partnership, state true name of firm, also names of all individual co-partners composing firm; if Bidder or other interested person is an individual, state first and last names in full.

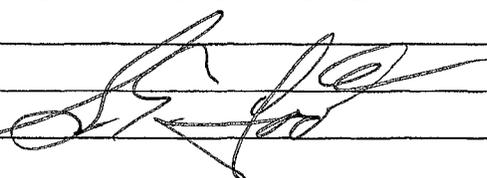
Bidder: **Stanek Constructors, Inc. George E. Foote**

Title: **Vice President**

Business Address: **2434 Auto Park Way, Ste 102 Escondido, CA 92029**

Place of Business: **Escondido, CA**

Place of Residence: **Carlsbad, CA**

Signature:  6-9-15

BIDDING DOCUMENTS

NOTES:

- A. The low Bid will be determined by the Base Bid alone.
- B. Prices and notations shall be in ink or typewritten. All corrections (which have been initiated by the Bidder using erasures, strike out, line out, or "white-out") shall be typed or written in with ink adjacent thereto, and shall be initialed in ink by the person signing the bid proposal.
- C. Failure to initial all corrections made in the bidding documents may cause the Bid to be rejected as **non-responsive** and ineligible for further consideration.
- D. Blank spaces must be filled in, using figures. Bidder's failure to submit a price for any Bid item that requires the Bidder to submit a price shall render the Bid **non-responsive** and shall be cause for its rejection.
- E. Unit prices shall be entered for all unit price items. Unit prices shall not exceed two (2) decimal places. If the Unit prices entered exceed two (2) decimal places, the City will only use the first two digits after the decimal points without rounding up or down.
- F. All extensions of the unit prices bid will be subject to verification by the City. In the case of inconsistency or conflict between the product of the Quantity x Unit Price and the Extension, the product shall govern.
- G. In the case of inconsistency or conflict, between the sums of the Extensions with the estimated total Bid, the sum of the Extensions shall govern.
- H. Bids shall not contain any recapitulation of the Work. Conditional Bids will be rejected as being **non-responsive**. Alternative proposals will not be considered unless called for.
- I. Subcontractors' License Number must be filled in. Failure to provide the information specified may deem the bidder **non-responsive**.

BIDDING DOCUMENTS

LIST OF SUBCONTRACTORS

In accordance with the requirements provided in the "Subletting and Subcontracting Fair Practices Act", Division 2, Part 1, Chapter 4 of the Public Contract Code, the Bidder shall list below the name and address of each Subcontractor who will perform work, labor, render services or 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 list below the portion of the work which will be done 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 shall 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 that Bidders are seeking recognition towards achieving any mandatory, voluntary, or both subcontracting participation percentages.

Subcontractors' License Number must be filled in. Failure to provide the information specified may deem the bidder **non-responsive**.

NAME, ADDRESS AND TELEPHONE NUMBER OF SUBCONTRACTOR	CONSTRUCTOR OR DESIGNER	SUBCONTRACTOR LICENSE NUMBER	TYPE OF WORK	DOLLAR VALUE OF SUBCONTRACT (MUST BE FILLED OUT)	MBE, WBE, DBE, DVBE, OBE, ELBE, SLBE, SDB, WoSB, HUBZone, OR SDVOSB	WHERE CERTIFIED	CHECK IF JOINT VENTURE PARTNERSHIP
Name: <u>NATIONAL COATING</u> Address: <u>26713 Madison Ave</u> City: <u>MARLETA</u> State: <u>CA</u> Zip: <u>92562</u> Phone: <u>9514713388</u> Email: <u>Info@nc-lc.com</u>	<i>contractor</i>	<u>886430</u> <u>C-33</u>	<u>Painting</u> <u>Coating</u>	<u>1,055,000-</u>	<u>SBA</u>	<u>CA</u> <u>gov</u>	✓
Name: <u>Southern Contracting</u> Address: <u>559 N. Twin Oaks Valley</u> City: <u>San Marcos</u> State: <u>CA</u> Zip: <u>92069</u> Phone: <u>760-744-0760</u> Email: <u>pwaterman@southerncontracting.com</u>	<i>contractor</i>	<u>922252</u>	<u>Electrical</u>	<u>1,014,000</u> <u>1,114,000</u>	<u>NO</u>	<u>NO</u>	✓

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 | | |

0.4749
MC

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 | San Diego Regional Minority Supplier Diversity Council | SRMSDC |
| 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.

BIDDING DOCUMENTS

NAMED EQUIPMENT/MATERIAL SUPPLIER LIST

The Bidder seeking the recognition of equipment, materials, or supplies obtained from Suppliers towards achieving any mandatory, voluntary, or both subcontracting participation percentages shall list the Supplier(s) on the Named Equipment/Material Supplier List. The Named Equipment/Material Supplier List, at a minimum, shall have the name, locations (City) and the **DOLLAR VALUE** of the Suppliers. The Bidder will be credited up to 60% of the amount to be paid to the Suppliers for such materials and supplies unless vendor manufactures or substantially alters materials and supplies in which case 100% will be credited. The Bidder is to indicate (Yes/No) whether listed firm is a supplier or manufacturer. In calculating the subcontractor participation percentages, vendors/suppliers will receive 60% credit of the listed **DOLLAR VALUE**, whereas manufacturers will receive 100% credit. If no indication provided, listed firm will be credited at 60% of the listed dollar value for purposes of calculating the Subcontractor Participation Percentage, Suppliers will receive 60% credit of the listed **DOLLAR VALUE**, whereas manufacturers will receive 100% credit. If no indication provided, listed firm will be credited at 60% of the listed **DOLLAR VALUE** for purposes of calculating the subcontractor participation percentages.

NAME, ADDRESS AND TELEPHONE NUMBER OF VENDOR/SUPPLIER	MATERIALS OR SUPPLIES	DOLLAR VALUE OF MATERIAL OR SUPPLIES (MUST BE FILLED OUT)	SUPPLIER (Yes/No)	MANUFACTURER (Yes/No)	MBE, WBE, DBE, DVBE, OBE, ELBE, SLBE, SDB, WoSB, HUBZone, OR SDVOSB®	WHERE CERTIFIED®
Name: <u>N/A</u> Address: _____ City: _____ State: _____ Zip: _____ Phone: _____ Email: _____						
Name: <u>N/A</u> Address: _____ City: _____ State: _____ Zip: _____ Phone: _____ Email: _____						

① As appropriate, Bidder shall identify Vendor/Supplier as one of the following and shall include a valid proof of certification (except for OBE,SLBE and ELBE):

- | | | | |
|---|--------|--|---------|
| Certified Minority Business Enterprise | MBE | Certified Woman Business Enterprise | WBE |
| Certified Disadvantaged Business Enterprise | DBE | Certified Disabled Veteran Business Enterprise | DVBE |
| Other Business Enterprise | OBE | Certified Emerging Local Business Enterprise | ELBE |
| Certified Small Local Business Enterprise | SLBE | Small Disadvantaged Business | SDB |
| Woman-Owned Small Business | WoSB | HUBZone Business | HUBZone |
| Service-Disabled Veteran Owned Small Business | SDVOSB | | |

② As appropriate, Bidder shall indicate if Vendor/Supplier is certified by:

- | | | | |
|--|--------|--|----------|
| City of San Diego | CITY | State of California Department of Transportation | CALTRANS |
| California Public Utilities Commission | CPUC | San Diego Regional Minority Supplier Diversity Council | SRMSDC |
| 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.

BIDDING DOCUMENTS

OMB Control No.: 2090-0030
 Approved: 08/13/2013
 Approval Expires: 08/31/2015



**Disadvantaged Business Enterprise (DBE) Program
 DBE Subcontractor Performance Form**

This form is intended to capture the DBE¹ subcontractor's² description of work to be performed and the price of the work submitted to the prime contractor. An EPA Financial Assistance Agreement Recipient must require its prime contractor to have its DBE subcontractors complete this form and include all completed forms in the prime contractor's bid or proposal package.

Subcontractor Name Southern Contracting Company		Project Name MBC-Chemical System Imp. Phase II	
Bid / Proposal No. K-15-6231-DBB-3	Assistance Agreement ID No. (if known)	Point of Contact	
Address 559 N. Twin Oaks Valley Road, San Marcos, CA 92069			
Telephone No. 760-744-0760		Email Address pwaterman@southerncontracting.com	
Prime Contractor Name Stanek Constructors, Inc.		Issuing/Funding Entity:	

Contract Item Number	Description of Work Submitted to the Prime Contractor Involving Construction, Services, Equipment or Supplies	Price of Work Submitted to the Prime Contractor
4-12	Electrical	1,014,000 1,114,000
DBE Certified By: ___ DOT : ___ SBA ___ Other: _____		Meets/exceeds EPA certification standards? ___ YES : ___ NO : <input checked="" type="checkbox"/> Unknown

¹ A DBE is a Disadvantaged, Minority, or Woman Business Enterprise that has been certified by an entity from which EPA accepts certifications as described in 40 CFR 33.204-33.205 or certified by EPA. EPA accepts certifications from entities that meet or exceed EPA certification standards as described in 40 CFR 33.202.

² Subcontractor is defined as a company, firm, joint venture, or individual who enters into an agreement with a contractor to provide services pursuant to an EPA award of financial assistance.

EPA FORM 6100-J (DBE Subcontractor Performance Form)

BIDDING DOCUMENTS

OMB Control No.: 2090-0030
 Approved: 08/13/2013
 Approval Expires: 08/31/2015



**Disadvantaged Business Enterprise (DBE) Program DBE
 Subcontractor Performance Form**

I certify under penalty of perjury that the forgoing statements are true and correct. Signing this form does not signify a commitment to utilize the subcontractors above. I am aware of that in the event of a replacement of a subcontractor, I will adhere to the replacement requirements set forth in 40 CFR Part 33 Section 33.302 (c).

Prime Contractor Signature 	Print Name
Title	George E. Foote
Vice President	Date
	June 9, 2015

Subcontractor Signature 	Print Name
Title	Philip E. Waterman
President	Date
	6/8/15

The public reporting and recordkeeping burden for this collection of information is estimated to average three (3) hours per response. Send comments on the Agency's need for this information, the accuracy of the provided burden estimates, and any suggested methods for minimizing respondent burden, including through the use of automated collection techniques to the Director, Collection Strategies Division, U.S. Environmental Protection Agency (2822T), 1200 Pennsylvania Ave., NW, Washington, D.C. 20460. Include the OMB control number in any correspondence. Do not send the completed form to this address.

EPA FORM 6100-3 (DBE Subcontractor Performance Form)

BIDDING DOCUMENTS

OMB Control No.: 2090-0030
 Approved: 08/13/2013
 Approval Expires: 08/31/2015



**Disadvantaged Business Enterprise (DBE) Program
 DBE Subcontractor Performance Form**

This form is intended to capture the DBE ¹ subcontractor's ² description of work to be performed and the price of the work submitted to the prime contractor. An EPA Financial Assistance Agreement Recipient must require its prime contractor to have its DBE subcontractors complete this form and include all completed forms in the prime contractors bid or proposal package.

Subcontractor Name SoCal Pacific Construction Corp. dba National Coating & Lining Co.		Project Name MBC - Chemical System Improvements - Phase II	
Bid / Proposal No. K-15-6231-DBB-3	Assistance Agreement ID No. (if known)	Point of Contact	
Address 26713 Madison Ave, Murrieta, CA 92562			
Telephone No. 951-471-3388		Email Address info@nc-lc.com	
Prime Contractor Name Stanek Constructors, Inc.		Issuing/Funding Entity: City of San Diego	

Contract Item Number	Description of Work Submitted to the Prime Contractor Involving Construction, Services, Equipment or Supplies	Price of Work Submitted to the Prime Contractor
2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12	A. Repair up to 650 linear feet of crack repair and 500 square feet of general concrete surface repair. B. Remove existing containment coating and apply new containment coating per Addendum C Section 09880. C. Prepare and finish coat new grating support. D. Prepare and finish coat new support clips. E. Prepare and coat CPVC pipe and appurtenances. F. Paint new and existing concrete steps.	1,055,000
DBE Certified By: ___ DOT : <u>X</u> SBA ___ Other: _____		Meets/exceeds EPA certification standards? <u>X</u> YES : ___ NO : ___ Unknown

¹ A DBE is a Disadvantaged, Minority, or Woman Business Enterprise that has been certified by an entity from which EPA accepts certifications as described in 40 CFG 33.204-33.205 or certified by EPA. EPA accepts certifications from entities that meet or exceed EPA certification standards as described in 40 CFR 33.202.

² Subcontractor is defined as a company, firm, joint venture, or individual who enters into an agreement with a contractor to provide services pursuant to an EPA award of financial assistance.

BIDDING DOCUMENTS

OMB Control No.: 2090-0030
 Approved: 08/13/2013
 Approval Expires: 08/31/2015



**Disadvantaged Business Enterprise (DBE) Program DBE
 Subcontractor Performance Form**

I certify under penalty of perjury that the forgoing statements are true and correct. Signing this form does not signify a commitment to utilize the subcontractors above. I am aware of that in the event of a replacement of a subcontractor, I will adhere to the replacement requirements set forth in 40 CFR Part 33 Section 33.302 (c).

Prime Contractor Signature	Print Name
	George E. Foote
Title	Date
Vice President	June 9, 2015

Subcontractor Signature	Print Name
	Anton Anstett
Title	Date
President	6/9/15

The public reporting and recordkeeping burden for this collection of information is estimated to average three (3) hours per response. Send comments on the Agency's need for this information, the accuracy of the provided burden estimates, and any suggested methods for minimizing respondent burden, including through the use of automated collection techniques to the Director, Collection Strategies Division, U.S. Environmental Protection Agency (2822T), 1200 Pennsylvania Ave., NW, Washington, D.C. 20460. Include the OMB control number in any correspondence. Do not send the completed form to this address.

EPA FORM 6100-3 (DBE Subcontractor Performance Form)



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NATIONAL COATING & LINING COMPANY - #39380

Supplier Profile

Legal Business Name	SOCAL PACIFIC CONSTRUCTION CORP		
Doing Business As	NATIONAL COATING & LINING COMPANY		
Address	26713 Madison Ave MURRIETA, CA 92562	Phone	(951) 674-1030
		FAX	(951) 471-3779
Email	tony@socal-pacific.com		
Business Types	Construction		
Service Areas	Fresno, Imperial, Kern, Los Angeles, Monterey, Orange, Placer, Riverside, Sacramento, San Bernardino, San Diego, San Francisco, Santa Barbara, Santa Cruz, Sutter,		
Keywords	GENERAL ENGINEERING GENERAL CONTRACTOR PAINTING AND DECORATING		
Construction License Types	A - General Engineering B - General Building Contractor C-33 - Painting and Decorating		
Classifications	471015 - Water treatment and supply equipment 721110 - Single family dwelling construction services 721111 - Multiple unit dwelling construction services 721211 - Commercial and office building construction services 721215 - Industrial plant construction services 721511 - Plumbing construction services 721513 - Painting and paper hanging services		

Active Certifications

TYPE	STATUS	FROM	TO
SB	Approved	Jan 8, 2014	Jan 31, 2017

Certification History

TYPE	STATUS	FROM	TO
SB	Expired	Jan 3, 2013	Jan 31, 2014
SB	Expired	Jan 16, 2012	Jan 31, 2013
SB	Expired	Jan 31, 2011	Jan 31, 2012
SB	Expired	Feb 17, 2010	Feb 28, 2011

BIDDING DOCUMENTS

OMB Control No.: 2090-0030
 Approved: 08/13/2013
 Approval Expires: 08/31/2015



Disadvantaged Business Enterprise (DBE) Program Subcontractor Utilization Form

This form is intended to capture the prime contractor's actual and/or anticipated use of identified certified DBE1 subcontractors 2 and the estimate dollar amount of each subcontract. An EPA Financial Assistance Agreement Recipient must require its prime contractors to complete this form and include it in the bid or proposal package. Prime contractors should also maintain a copy of this form on file.

Prime Contractor Name Stanek Constructors, Inc.		Project Name MBC-Chemical System Improv. Phase II	
Bid / Proposal No. K-15-6231-DBB-3	Assistance Agreement ID No. (if known)	Point of Contact George E. Foote	
Address 2434 Auto Park Way, Ste. 102 Escondido, CA 92029			
Telephone No. 760-871-0102		Email Address gfoote@stanekconstructors.com	
Issuing/Funding Entity:			

I have identified potential DBE Certified subcontractors	— YES	<input checked="" type="checkbox"/> NO
--	-------	--

If yes, please complete the table below. If no, please explain:

NOT CERTIFIED

Subcontractor Name/ Company Name	Company Address / Phone / Email	Est. Dollar Amt	Currently DBE Certified?
<i>Southern Contracting CO</i>	<i>559 N TWIN OAKS Valley Rd, SAN MARCOS CA 92069 760-744-0760</i>	<i>1,114,000</i>	<i>NO</i>
	<i>p.walterman@SouthernContracting.com</i>	<i>7,019,000</i>	

¹ A DBE is a Disadvantaged, Minority, or Woman Business Enterprise that has been certified by an entity from which EPA accepts certifications as described in 40 CFR 33.204-33.205 or certified by EPA. EPA accepts certifications from entities that meet or exceed EPA certification standards as described in 40 CFR 33.202.

² Subcontractor is defined as a company, firm, joint venture, or individual who enters into an agreement with a contractor to provide services pursuant to an EPA award of financial assistance.

EPA FORM 6100-4 (DBE Subcontractor Utilization Form)

BIDDING DOCUMENTS

OMB Control No.: 2090-0030
 Approved: 08/13/2013
 Approval Expires: 08/31/2015



Disadvantaged Business Enterprise (DBE) Program Subcontractor Utilization Form

This form is intended to capture the prime contractor's actual and/or anticipated use of identified certified DBE¹ subcontractors and the estimate dollar amount of each subcontract. An EPA Financial Assistance Agreement Recipient must require its prime contractors to complete this form and include it in the bid or proposal package. Prime contractors should also maintain a copy of this form on file.

Prime Contractor Name Stanek Constructors, Inc.		Project Name MBC-Chemical System Improv. Phase II	
Bid / Proposal No. K-15-6231-DBB-3	Assistance Agreement ID No. (if known)	Point of Contact George E. Foote	
Address 2434 Auto Park Way, Ste. 102 Escondido, CA 92029			
Telephone No. 760-871-0102		Email Address gfoote@stanekconstructors.com	
Issuing/Funding Entity:			

I have identified potential DBE Certified subcontractors	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO	
If yes, please complete the table below. If no, please explain:			
Subcontractor Name/ Company Name	Company Address / Phone / Email	Est. Dollar Amt	Currently DBE Certified?
NATIONAL COATINGS	26713 Madison Ave Manteca, CA 92567 9514713388, Info@nc-llc.com	1,055,000	SGA
Continue on back if needed			

¹ A DBE is a Disadvantaged, Minority, or Woman Business Enterprise that has been certified by an entity from which EPA accepts certifications as described in 40 CFR 33.204-33.205 or certified by EPA. EPA accepts certifications from entities that meet or exceed EPA certification standards as described in 40 CFR 33.202.

² Subcontractor is defined as a company, firm, joint venture, or individual who enters into an agreement with a contractor to provide services pursuant to an EPA award of financial assistance.

EPA FORM 6100-4 (DBE Subcontractor Utilization Form)

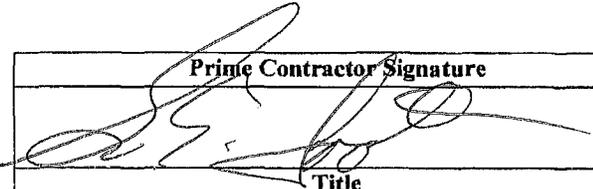
BIDDING DOCUMENTS

OMB Control No.: 2090-0030
Approved: 08/13/2013
Approval Expires: 08/31/2015



**Disadvantaged Business Enterprise (DBE) Program
Subcontractor Utilization Form**

I certify under penalty of perjury that the forgoing statements are true and correct. Signing this form does not signify a commitment to utilize the subcontractors above. I am aware of that in the event of a replacement of a subcontractor, I will adhere to the replacement requirements set forth in 40 CFR Part 33 Section 33.302 (c).

Prime Contractor Signature 	Print Name George E. Foote
Title Vice President	Date June 9, 2015

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EPA FORM 6100-4 (DBE Subcontractor Utilization Form)

Stanek Constructors, Inc.

651 Corporate Circle
Telephone (303) 980-8233

◆ Suite 108 ◆

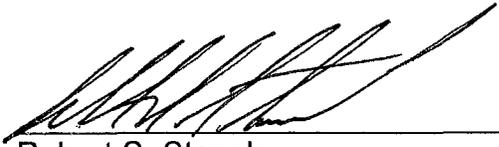
Golden, Colorado 80401
FAX (303) 980-8145

March 10, 2015

CORPORATE RESOLUTION

This resolution shall serve as authorization for the following persons to sign any and all documents that are legally binding of the corporation on behalf of Stanek Constructors, Inc. a Colorado corporation.

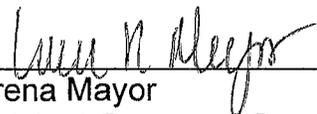
Robert S. Stanek - President/CEO
Jerry E. Arguello – Vice President/CFO
George E. Foote – Vice President/Division Manager
Diane M. Stanek – Director/Secretary
Lorena Mayor – Assistant Corporate Secretary



Robert S. Stanek
President

3/10/15

Date



Lorena Mayor
Assistant Corporate Secretary

3/10/15

Date